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Some Cases of Poisoning amongst Farm Animals by Food or Medicine.*

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The Chemistry of Food.

The importance of applying the science of chemistry to agriculture was first clearly indicated by Liebig, who in 1840 published his book entitled "Chemistry in its Application to Agriculture and Physiology," in which he demonstrated the value of chemical analyses of soils and plant products and thus laid the foundations of our knowledge of vegetable and animal nutrition. Methods have been devised for determining the quantities of proteins, carbohydrates, fats and mineral compounds in foods, and the results of analyses of numerous foods are recorded in the journals and text-books of agricultural chemistry. But it is necessary to bear in mind that not only the amount but the nature of these constituents in food should be considered in animal nutrition. For example, proteins are very complex compounds built up of units, the amino-acids; the innumerable proteins differ from one another in that they consist of varying quantities and arrangements of these amino-acid units. During digestion the proteins are broken down by enzymes to the constituent amino-acids, some of which after absorption recombine to form new proteins characteristic of the species of animal. The casein of cows' milk is different from the casein of ewes' milk. It is thus clear that the proteins of some foods are much more suitable than those of other foods for the nutrition of a given species. Enzymes are also present in plants; thus castor beans contain a fat-splitting enzyme (lipase), soya beans contain urease, whereas flax and mustard seeds contain enzymes which resolve glucosides into their components. That chemical analysis alone is insufficient to indicate the value of a food has been demonstrated by the discovery that the absence of certain kinds of food in a dietary may lead to malnutrition, scurvy, rickets, etc. The assumption has therefore been made that for animal nutrition and for continued health, dietaries must contain minimum amounts of certain compounds (the so-called vitamins), the isolation of which has not been effected up to the present time. We are ignorant of the action of these bodies in preventing the diseases in question, some of which may perhaps be due to the accumulation of toxic substances in the blood and organs of the animal. Some plants contain specific poisonous compounds which render them injurious to animals; these toxic substances may be alkaloids, glucosides, or proteins (toxalbumins). I propose in this paper to deal with a few examples of foods, or materials which may be present in some foods, which have been proved to be, or which are suspected to be, injurious to farm animals.

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Our knowledge of the poisonous action of plants on farm stock in this country is in an unsatisfactory condition, owing to the fact that little systematic research in connection with this subject has been prosecuted in Great Britain. Some important investigations have been carried out abroad, but the results obtained under conditions prevailing in other countries can only be of limited application to our own problems. The practical difficulties of such investigations are manifold. For example, there appear in some cases to be local and seasonal variations in the toxicity of a given plant; animals of different species and even of the same species do not always react in the same manner after consuming the same toxic material. Little confidence, therefore, can be placed in results obtained by feeding to (say) guinea pigs a material which is suspected of being harmful to horses. The injurious effects produced by some plant poisons on animals are not apparent until a large amount of material has been consumed over a considerable period of time; it is thus evident that in such cases feeding tests made with a few pounds of material consumed in two or three days cannot be expected to be of service. I cannot think that such complexities as these prevent research, for in other branches of science the more difficult the problems the more anxious are investigators to make experiments in order to solve them. It appears to me that the chief difficulty is that of finance. In order to carry out a comprehensive programme of research in this field a considerable amount of money would be required, without which investigation with a reasonable prospect of success is impossible.

Soya Bean Meal extracted with Trichlorethylene.

In 1916 the late Sir Stewart Stockman described a fatal outbreak of illness in cattle in a district in the south of Scotland. (*Journ. Comp. Path.*, 1916, *29*, 95.) On nine farms sixty-three animals were affected and of these fifty-four died. The food, consisting of soya bean meal (which had been extracted with trichlorethylene) hay, crushed oats and bran, was fed from fifty to seventy days and in that time each animal had consumed from 150 to 213 pounds of soya meal. The cattle had been turned out to feed in the open for an hour or so daily. In some cases illness was not observed until from two to twenty-eight days after the feeding with soya had been discontinued. A diminution of the milk supply, bleeding at the nose, high temperatures (105°—109°F.), abdominal pain and small blood clots in the fæces were observed. *Post-mortem* examinations revealed hæmorrhages in the subcutaneous tissues, muscles and viscera. The lapse of time between the observed onset of symptoms and death varied from one to seventeen days. In no instance was a bull, young heifer or calf observed to be affected; neither sheep nor pigs were attacked, although they had received the suspected food. Feeding experiments on four heifers were made at the laboratory of the Ministry of Agriculture, and the same symptoms and

post-mortem findings were reproduced. A ewe and two pigs were unaffected, although one pig consumed 250 pounds of the meal in 100 days. Stockman's enquiries elicited the information that the whole soya bean was not poisonous, that soya meal extracted with naphtha had been fed with no ill effect, but that the accidents synchronised with the employment of trichlorethylene as extracting solvent in place of naphtha. In 1923 Grebe, Unterhössel and Eickmann published an account of a disease which occurred in the province of Düren in the Rhineland. (*Berl. tier. Woch.*, 1923, *39*, 464.) Knörchen reported a similar outbreak in the Ruhr. (*Ibid.*, 1924, *40*, 145.) The disease also appeared at about the same time in the provinces of Limburg and Brabant in Holland. An investigation of the disease was made by Frosch and Nöller in Germany, and these workers found that soya meal had been fed on all the farms where the disease had appeared. (*Ibid.*, 1924, *40*, 171.) They made a bacteriological examination and expressed the opinion that the damage was not due to poisoning by soya meal, but that it was caused by bacterial infection. Bass appears to have been the first to direct attention to the close similarity of the Düren disease to that described by Stockman in 1916. An enquiry into the feeding of cattle in those districts where the disease had occurred led to the discovery that on those farms where no soya was fed, there had been no evidence of the disease, but on all those farms where animals had been affected this meal had been fed in quantities varying from one to eight pounds daily. (Lothes and Profé, *ibid.*, 1924, *40*, 513.) It was found that 98·3 per cent. of the animals attacked were cows, these having received much larger quantities of the meal than other animals. Again the outbreaks occurred at about the time when the solvent for the extraction of the oil had been changed from naphtha or benzene to trichlorethylene. The German investigators appear to have met with less success than Stockman in reproducing the disease by feeding experiments. Eickmann, however, made feeding experiments on four cows, and of these one died exhibiting the typical symptoms and lesions. (*Deutsch. tier. Woch.*, 1924, *32*, 648.)

Stang and Radeff reported that they found a change in the blood picture of cattle after feeding on soya extracted with "tri," but that no such change occurred when animals were fed on the meal which had been extracted with benzene or alcohol. (*Ibid.*, 1926, *42*, 495.)

In 1926 fatalities due to the same cause occurred in Staffordshire. A farmer with a herd of sixty-four dairy cows and sixty young stock had fed soya meal with no ill effect until a fresh supply of four tons obtained from another vendor was employed. The cattle were fed on a mixture of dried grains, maize meal, extracted soya meal and compound cake, in addition to hay and roots. The heaviest milkers received about three pounds and the young stock about one pound of the soya daily. In about six weeks the cows giving the largest amounts of milk commenced to show signs of illness, the symptoms being loss of appetite, greatly diminished secretion of milk, bleeding at the nose, temperature 105°F. and upwards; the eyes and vagina were swollen, the fæces contained bloody mucus, and swellings were observed on various parts of the body. Twelve milking cows died, the deaths occurring 32, 44, 58, 60, 62, 63, 65, 68, 74, 83 and 86 days after the beginning of feeding on the suspected food; the quantities of soya meal consumed by these animals varied from 100 to 250 pounds per head. Other cows and all the young stock fed on the meal were affected and showed similar symptoms. Some cases occurred after the feeding on soya had ceased, but the general condition subsequently improved and the trouble gradually disappeared. *Post-mortem* examination revealed sub-pleural, sub-peritoneal and intestinal hæmorrhages.

It is thus clear that soya meal extracted with trichlorethylene when fed in fairly large amounts for some weeks may produce fatal illness in cattle. What is the cause of this injurious effect? Is it due to the presence of some specific toxic substance in the food or is there a deficiency in the ration of some material essential to the health of bovines? In an endeavour to answer the first question Sir S. Stockman gave a heifer three ounces of trichlorethylene in six ounces of linseed oil daily for thirty-nine days, but no ill effect was observed. It was therefore concluded that the disease was not due directly to the presence of any remaining solvent in the meal. In connection with the second question it may be remarked that the chief characteristic of scurvy in the human subject is the occurrence of numerous small hæmorrhages throughout the body, more particularly between the teeth and round the bones and joints, the ultimate effect being almost complete loss of muscular power. It has been shown that these symptoms may be prevented or cured by the addition of fresh fruit or vegetables to the dietary. Hence it is assumed that in foods such as orange juice or swedes there is a substance (the antiscorbutic vitamin or vitamin C) essential to the health of man. Stockman rejected the possibility of the disease he investigated being due to a deficiency of some vital constituent, since the animals were receiving other foods besides soya. In view of the high temperatures exhibited, he was of opinion that the meal might contain a toxin, but no other evidence in support of this view was advanced.

Dr. Ralph Stockman has recently published a paper in which he states that he has made a chemical examination of soya beans and meal for a poisonous alkaloid or albumose, but, as he expected, nothing of the kind was found. (*Journ. Comp. Path.*, 1927, *40*, 266.) He also made feeding tests on rabbits and guinea pigs and found that on an exclusive diet of soya meal (extracted with naphtha) or soya beans guinea pigs died in two to five weeks and rabbits in two to three months from malnutrition, with the addition of scurvy lesions in the guinea pigs but not in the rabbits. When orange juice or cabbage juice was added to the soya dietary scurvy did not appear in the guinea pigs, but the animals died in about the same time as when fed on soya only. But when fresh cabbage was added to the soya meal both guinea pigs and rabbits thrived normally. Dr. Stockman asserts "in the case of the cattle fed on the mixture of soya meal, oats, bran and hay, scurvy was certainly produced." Dr. Stockman has kindly informed me that the meal used in his experiments had been extracted with naphtha. There is, however, no evidence that such a meal has ever proved harmful to bovines. Evidently more experimental work is necessary before it can be stated definitely how the feeding of extracted soya meal causes these serious fatalities in cattle.

BRACKEN.

I must next refer briefly to "bracken poisoning," because the symptoms and lesions exhibited by cattle suffering from this disease are strikingly similar to those shown in "soya poisoning." Again we owe much of our knowledge of this disease to Sir Stewart Stockman. The symptoms are: high temperature, up to 107°F.; loss of appetite, trickling of blood from mucous membranes of eyes, nostrils and vagina; blood clots in fæces, swellings under the skin, occasionally lameness, coma and death usually in from twelve to seventy-two hours after the onset of symptoms. In some cases symptoms do not appear until the animals have been removed from pastures in which bracken is growing. The lesions include subpleural and subperitoneal hæmorrhages; hæmorrhages under the skin and into the skeletal muscles; innumerable small hæmorrhages on the mucous membrane and larger hæmorrhages in the stomach and intestines. Stockman produced bracken poisoning experimentally in bovines. When the green plant was fed in rations of ten pounds daily for twenty-nine days to a bull calf, symptoms appeared on the 26th day and death occurred four days later. The symptoms and lesions were identical with the field cases. A further feeding test was made in which a ration of four pounds of green bracken with a generous ration of chopped swedes (a food rich in vitamin C) was fed daily to a calf for 28 days. The animal then showed symptoms of illness (temperature 105° to 107°F.) and died two days later. The lesions were typical of bracken poisoning. Stockman therefore concluded that the trouble did not arise from avitaminosis, but that it was probably due to a specific poisonous substance which had not been isolated.

In 1920 a disease of cattle was reported in New York State. (Bosshart and Hagan, *Cornell Vet.*, 1920, *10*, 102; 1922, *12*, 43; 1925, *14*, 326.) It was suspected that the losses were due to the eating of bracken, and feeding experiments were subsequently made by Hagan and Zeissig. (*Ibid.*, 1927 *17*, 196.) A young bull was fed daily for fifty-one days with about 6½ pounds of bracken and with other food. Fourteen days after the last feeding, the animal was found to be ill (temperature 107°F., nasal bleeding, etc.) and died on the same day. Further investigation is obviously required in order to elucidate how the eating of bracken causes these symptoms in cattle.

It may be added that bracken poisoning in horses has been reported from the Continent, the United States and British Columbia, but the symptoms (staggering, nervousness, constipation) are quite different from those observed in bovines.

RAGWORT.

A weed which may also cause damage to bovines and horses, especially when it is fed in hay, is ragwort (*Senecio jacobæa*). In Canada the cause of Picton cattle disease (*hepatic cirrhosis*) has been shown to be due to the eating of ragwort, whilst in South Africa the Molteno cattle sickness has been proved to be caused by *Senecio latifolius*. Fatal intoxications have been produced by feeding eight to ten pounds of this weed in daily amounts of six to eight ounces. In Great Britain ragwort poisoning has been definitely established. (Stockman, *Journ. Comp. Path.*, 1917, *30*, 131.) Mr. T. Knowles, in a paper read before your Division on this subject, gave a most useful account of the symptoms and lesions he had observed in cases of chronic poisoning by ragwort in cattle and of chronic and acute poisoning in horses. (*Vet. Rec.*, 1926, 618.) The commonest symptoms appear to be staggering, impaired vision, nervous excitement, frenzy, constipation with violent straining, occasionally diarrhœa and eversion of the rectum. The *post-mortem* appearances include small hæmorrhages under the mucous membrane of bowel and impaction of the stomach. In chronic cases the liver is hard, enlarged and cirrhotic. The poison appears to be cumulative, the ingestion of a considerable amount of the English weed being required before the appearance of visible symptoms, which in some cases have not been observed until the cessation of feeding on ragwort. Chemical investigation of the plant has resulted in the separation of alkaloids, which may be the cause of the toxic action, but further work in this connection is desirable.

HORSETAIL.

In 1926 Goldsmith described an outbreak of illness in cattle, the symptoms being loss of appetite, diarrhœa, grunting, temperature 103·4°F., large baggy swelling round the eyes causing partial closure of the eyelids and diminished milk secretion. (*Vet. Rec.*, 1926, 486.) It was found that the hay fed to these animals contained large quantities of horsetail (*Equisetum arvense*). In twelve days the cows were normal except that the milk yield had been considerably lowered. Hudson in 1924 recorded a case of illness in cattle caused by the same weed. In America Rich and Jones have definitely demonstrated that the scouring rush (*Equisetum arvense*) is fatally poisonous to horses and to a less degree to sheep. Heavy losses among horses due to the same cause have been reported in New England. Cattle and horses have been fed on hay containing a large amount of equisetum and, although no trouble was noted among cattle, several of the horses showed symptoms of poisoning. The first symptom was stiffness, followed by incoordination, impaired vision, nervousness, profuse urination and paralysis. (Hansen, *N. Amer. Vet.*, 1928, *9*, 24.) On the other hand Lohmann, who made feeding experiments in Germany, concluded that *Eq. arvense* is a harmless plant, but that *Eq. palustre* is injurious to cattle. He suggested that the contradictory observations on record may be due to chemical variations in the composition of the weed, the poisonous principle being in his opinion an alkaloid, equisetine.

NEW HAY.

It appears to be established that new hay, especially "sweated hay," may produce illness, sometimes fatal, in horses, the symptoms being diarrhœa, colicky pains, dulness and some filling of the legs. Dammer states that febrile gastro-enteritis, jaundice, thirst, flatulence and drowsiness are observed in cattle and horses. In 1888 an outbreak occurred amongst circus horses at Lucerne (Zschokke, *Journ. Comp. Path.*, 1921, *34*, 135.) Illness was observed in a batch of seventy-five animals and within thirty-six hours fifteen were dead. In the severe cases the temperature reached 105·8°F., and at the time of death there were symptoms of heart failure accompanied by stertorous dyspnœa. The *post-mortem* examination showed hyperæmia of the small intestine, vessels of lungs engorged, heart relaxed and flaccid. The affected animals had been

fed on new " sweating " hay, and a feeding test made with the hay produced symptoms of illness in a horse. It has been suggested that the cause of the poisonous action is the presence of aromatic compounds (for example, coumarin) in the new hay, but this hypothesis has not been experimentally verified.

Is Chickweed Poisonous ?

Chickweed (*Stellaria media*) has been suspected of causing digestive disorders when eaten in large quantities by lambs or sheep. M'Fadyean fed a cross-bred adult sheep on the weed ; the animal consumed 5½ pounds within four days and this quantity appeared to exert no injurious effect whatever on the animal either at the time or subsequently. (*Report of R.V.C. to R.A.S.E.*, 1924, p. 6.)

Corn Cockle.

The question of the potential injury of corn cockle to domestic animals has frequently been a subject of discussion. The weed contains a saponin, which produces hæmolysis when introduced into the blood stream. In general, saponins are not absorbed by the intact mucous membrane, but absorption may occur when inflammatory lesions are present. Cornevin gives the lethal doses (per 100 pounds body weight) of cockle flour as 4 ounces for a calf, 4 ounces for a fowl and 1½ ounces for a pig. In 1890 Pesch made a thorough study of the toxic action of corn cockle and his conclusions are worthy of note, especially as some of his observations undoubtedly apply to many other plant poisons : " Under certain conditions corn cockle is injurious to animals. The amount of poison in the seed is variable and is probably dependent on the season and soil. The susceptibility of animals to the poison varies with the species and the individual. Young animals are more susceptible than older ones. Cattle are only slightly affected, but calves, pigs, horses and especially dogs are more or less susceptible." Kornault and Archer (1892), however, made feeding experiments and concluded that corn cockle was not poisonous for pigs, but rather that it was a valuable food for these animals. In 1918 von Degen showed experimentally that the meal was distinctly poisonous to poultry. I may refer to an interesting legal action heard at Liverpool in 1922 before Mr. Justice Swift (*Brumby v. Jones and Co.*). The plaintiff, an owner of pigs in N. Wales, alleged that a proportion of 0·15 per cent. of corn cockle in certain " thirds " sold to him was responsible for the deaths of a number of his pigs. For the defence it was stated in evidence that, in conjunction with Mr. Stafford Jackson, Mr. A. Smethan had made feeding experiments, using corn cockle which was hand-picked from cockle screenings from the same class of wheat as was used in the manufacture of the " thirds." A daily ration of eight pounds of food containing 0·3 per cent. of cockle was fed to each of three middle white pigs (16 weeks old) for thirty days ; similar rations containing 0·15 per cent., 0·6 per cent. and 0·9 per cent. of cockle respectively were also fed to three other pigs for the same time. During this time, it was stated, the pigs thrived exceedingly. They were then killed, and *post-mortem* examinations made on two pigs showed that all the internal organs of both pigs were in a perfectly healthy condition with the exception that the mucous lining of the stomach of one was perhaps slightly thickened and the villous portion slightly discoloured, but not enough to cause any irritation or constitutional disturbance. In giving judgment for defendants, Mr. Justice Swift said that he was not satisfied that the amount of corn cockle seed in the " thirds " sold to plaintiffs contained a sufficient quantity of saponins to cause the death of the pigs.

Feeding trials were conducted by the Ministry of Agriculture in 1925 and 1926. Three pigs received about one pound of pure corn cockle daily with middlings ; in sixty-four days one pig received fifty-five pounds of cockle and the other two about fifty-seven pounds in seventy-seven days. The pigs grew and thrived normally and remained in perfect health.

I have been told that corn cockle poisoning was the cause of a number of deaths of horses in the French army during the War.

Lathyrus Sativus.

Poisoning in the horse by the Indian " mutter pea " is still occasionally encountered in this country. Thirteen horses had been fed during the winter with a mixture containing peas. The food had been discontinued for two or three weeks, but when the animals were at work they were attacked with symptoms of roaring, bleeding at the nose and collapse. The peas were submitted for identification and found to consist of *Lathyrus sativus*. The cause of the toxic action of this vetch still awaits elucidation.

Castor Beans.

Ehrlich has shown that castor seeds contain a poisonous substance, ricine, which has the properties of a protein and is sometimes termed a toxalbumin. In 1891 he produced an antitoxic substance, antiricine, in animals which was capable of neutralising the poisonous ricine. The serum from such an animal gives a precipitate with a solution containing ricine and this phenomenon led to the precipitin test for ricine. There is also an agglutination test for ricine and a third test devised some years ago by Sir John M'Fadyean. Horses, cattle and pigs have been fatally poisoned by eating food adulterated with castor. In 1925 thirteen bovines were fed on a proprietary mixed food, and two days after commencing this food they were all suffering from acute diarrhœa and inappetence. Two showed a temperature of 103°F., but the temperatures of the others were normal or slightly subnormal. A boar pig on the same farm showed similar symptoms. On another farm fourteen animals after feeding on the same mixture were taken ill with similar symptoms. On a third farm eighteen cows which had received the same mixed food showed similar symptoms, whilst three animals which had not received this food were unaffected. In several of the affected animals there was frequent passage of small quantities of urine ; the milk yield was diminished, but none of the animals died. The food was found to contain castor and it was thus evident that ricine poisoning was the cause of the outbreaks of illness. It is remarkable that the feeding of twelve ounces of the whole seeds of *R. communis*, followed after four days by the giving of eighteen ounces of pressed seeds, did not seriously affect a calf. (Lander and Edwards. *Record*, 1914, 615.)

Mustard.

Mustard seeds contain a glucoside, sinigrin, which, in the presence of water and an accompanying enzyme, gives rise to the volatile oil of mustard, an irritant poison.

Mustard is found occasionally as an adulterant in rape cake. In 1875 Tuson described three cases of poisoning by rape cake containing wild mustard. In one case thirty-seven calves were affected of which eight died; the symptoms were indicative of narcoto-irritant poisoning. In every case intense inflammation of the stomachs and intestines was observed. I believe that there were several outbreaks of illness among cattle in Lincolnshire in 1918 owing to the same cause. The following is a typical example: eight cows in milk were fed with a cake (two pounds to each animal) in the morning; in about two hours the animals were ill, showing violent colicky pains and kicking at the body. The pains ceased in about three hours; one cow died three hours later, but the others recovered. *Post-mortem* examination revealed inflammation of the stomach, the walls being of a deep purple colour. Analysis showed that black mustard was present in the cake.

CACAO SHELLS.

The shells removed after the roasting of cacao beans have been used for feeding farm animals on the Continent and in England during and since the Great War. The feeding of large quantities to horses has produced fatal results. In a Danish case the rations of horses contained 2¼ pounds of cacao shells on several occasions, with the result that one animal died after a short illness from paralysis of the heart; the symptoms included sweating, exhaustion, unsteady gait and yawning. In a Berlin case several horses became ill and one died after being fed on shells from a chocolate factory. (*Journ. Bd. Agric.*, 1916, *23*, 498.) Feeding experiments on cattle were made in Denmark in 1911-13. In one experiment three pounds of cacao cake replaced two pounds of ground nut and soya bean cake in the ration; the effect was that the milk yield was reduced by 2·6 pounds per cow per day. Veterinary investigation showed the cake to be poisonous. In 1926 the feeding of cacao shell to milking cows on a farm in Staffordshire resulted in a very serious diminution in the milk supply. I found that the cacao shell contained 1½ per cent. of theobromine and there is no doubt that the diminished secretion of milk was due to the presence in the food of this high percentage of theobromine, a compound very similar in chemical composition and physiological action to caffeine.

LINSEED.

As long ago as 1883 it was found that linseed may yield appreciable amounts of hydrocyanic acid and, in 1908, Henry and Auld showed that linseed cakes (consisting of crushed flax seed from which most of the oil had been pressed) contained a cyanogenetic glucoside, phaseolunatin, which was decomposed in the presence of water by an accompanying enzyme. The glucoside itself is non-poisonous, so that no harm can result in feeding if the enzyme has been destroyed by heat (as in the process of hot expression of the oil). Linseed cakes usually yield from 0 to 0·06 per cent. of prussic acid, but recently a specimen yielding 0·086 per cent. has been encountered by Brioux and Richart. (*Bull. de l' Acad. Vétér*, 1928, *1*, 134.) The best temperature for the rapid generation of hydrocyanic acid is about 40°C., at which temperature about 50 per cent. of the acid is liberated in less than half an hour, the maximum amount being formed in from three to five hours. But if the enzyme is destroyed by boiling water, no appreciable amount of hydrocyanic acid is subsequently produced. It is thus clear that the conditions for obtaining rapidly the maximum quantity of prussic acid, and therefore the worst possible way of preparing the food, is to make a gruel of the meal with water and that the best way is to pour boiling water on to the meal or to add the meal to actively boiling water and allow to cool. Fatalities most commonly occur after feeding young calves with a gruel obtained by mixing a meal yielding a high proportion of prussic acid with warm water. There appears to be little danger of damage if the dry meal is fed, since the gastric fluids and ingesta to some extent retard the generation of prussic acid.

A typical case may be quoted: Five calves died after partaking of porridge prepared from a calf meal. The symptoms exhibited were double respiration, tympanites and paralysis. I found that the meal was linseed, which on maceration with water at body temperature yielded 0·05 per cent. of prussic acid.

The legal aspect is of interest, as a recent judgment implies that stockowners should be acquainted with the correct method of preparing the food. (*Robinson v. Sturdy.*) On November 10th, 1926, an appeal was heard in the King's Bench Division of the Northern High Court, Belfast, from a decision of the County Court Recorder, who had awarded £20 and costs to a farmer for the loss of two calves which had died from the effects of prussic acid, alleged to have been contained in linseed meal sold by defendant as cattle food. The meal was found to be capable of generating 0·06 per cent. of prussic acid. The judge said that he had come to the conclusion that, if properly prepared, the meal would be suitable for cattle food and that the deaths of the calves were due to the negligence or carelessness with which it was prepared by plaintiff. He could not hold defendant responsible, because there was no regulation as to the amount of prussic acid which might be in the meal. He must reverse the decision of the Recorder. In this connection it may be mentioned that the *Société des Chimistes experts de France* in 1920 recommended that the sale of linseed cake foods furnishing more than 0·02 per cent. of prussic acid should be prohibited.

Craig and Kehoe, in a valuable paper on vegetable poisons, have directed attention to the amounts of prussic acid in linseed meals which have caused fatal intoxications in calves. Thus, in a case in which ten calves (average three months old) were affected (two died), the average amount of prussic acid in the feed of each calf was calculated to be 1·84 grains. (Dunne.) In a second case fifteen calves (1½ to 6 months) were fed, ten were ill and two died; the average amount of prussic acid in a feed was 1·63 grains. (Montgomerie.) A third example was given in which three calves were affected and of these two died, the average amount of poison being 1·5 grains. (Sanderson.) To these examples may be added one reported by Wilson (*V.J.*, 1924, 79) in which one calf (five months) died and another was severely affected, whilst older animals showed less severe symptoms, which appeared in less than fifteen minutes after being fed with soaked linseed meal yielding 0·04 per cent. of prussic acid. The amount fed (average ¾ pound) corresponds with a prussic acid content of 1·5 grains. Craig and Kehoe point out that it is remarkable

that the prussic acid should be responsible for losses among young cattle by the use of linseed meal when chemical analysis demonstrates that the total amount of prussic acid in the food is what would appear to be far below the toxic dose, judging from direct experiment with hydrocyanic acid in a bovine of greater age (see Lander, *V.J.*, Aug., 1911). It should, however, be stated that Lander used potassium cyanide and not free prussic acid in his experiments on the lethal dose for a heifer. The fatal dose of prussic acid for a young calf has not been experimentally determined. The lethal dose for man is usually assumed to be approximately one grain (Taylor); Kohn-Alrest gives 0·75 to 1 grain. If, for the sake of argument, we assume that the fatal dose for animals is proportionately the same as in man (160 pounds) the amount required to kill a young calf (two to three months) would be of the same order of magnitude. Further, Finlay Dunn gives the lethal dose for a horse as five grains, Kaufmann's figure is six grains, whilst Kobert states that for animals the mortal dose is 0·7 to 1·5 grains per 100 pounds body weight. Assuming that in the cases cited by Craig and Kehoe the calves which died were the greedy ones, there is really no contradiction between the calculated lethal dosage and the amount of prussic acid probably received in the food by the animals in question.

Outbreaks of poisoning by linseed cake among sheep have been reported recently in France. (Moussu, *Rec. Méd. Vétér.*, 1927, *103*, 5; Perrot, *ibid.*, 1928, 15.) Linseed cake is employed for fattening lambs in some parts of France, the amounts fed being from ½ pound to ¾ pound per head, but doubtless some animals receive more than the average ration. During six months out of 400 ewes on a farm nine died, of 280 rams eight died and, in addition to the sheep, twenty-five lambs (aged from a few days to four months) succumbed showing the same symptoms as the adults. The symptoms observed were accelerated respiration, eyes injected, general stiffness, spine and limbs rigid, whilst the *post-mortem* examinations revealed no abnormalities. A sample of cake was found to yield 0·043 per cent. of prussic acid and the damage was doubtless due to prussic acid poisoning. It is noteworthy that fatalities occurred even among lambs at milk and it is therefore assumed that the poison eliminated by the milk produced the same trouble as in the ewes—a hypothesis which merits experimental enquiry. Brious and Richart have quite recently published interesting results of feeding calves experimentally with food prepared under varying conditions from a meal with a prussic acid content of 0·086 per cent. (*loc. cit.*).

The important results which have been obtained by the chemical investigation of linseed, castor, mustard and cacao shell should prove an incentive to the prosecution of research into the more recondite poisonous principles of many plants.

Chemistry and Medicine.

The origin of chemistry is found in the experimental work of the old alchemists. In course of time the character of chemistry changed profoundly. The physician became chemist and the period of *iatrochemistry* commenced. During this time the physiological actions of many substances which had been prepared by the alchemists were investigated. It is interesting to compare some of the views of the old iatrochemists with those prevailing in modern medicine. There was an old maxim quoted more than three centuries ago:—

In sale et sole existunt omnia

(On salts and sunshine all things depend).

To-day the fashion is light therapy. The vital importance of mineral salts in food has been re-discovered and the tonic effects of mineral salts on blood and nerves are well recognised. The acids, prepared from salts by the alchemists, had a great vogue as curative agents; spirit of salt was regarded as an almost universal cure for the ills of man. Now we have acid therapy; acids are employed for the treatment of respiratory diseases, etc. A measure of the acidity or alkalinity of fluids is expressed by the "hydrogen ion concentration" of the fluid, and Arrhenius, the founder of the modern theory of electrolytic dissociation, has expressed the view that "all living nature is regulated by the hydrogen ion concentration. Health and sickness, life and death, are ruled by it. ("Chemistry and Modern Life"; see Walden, *Science*, 1927, *66*, 407.)

In recent years chemists have been preparing a bewildering number of synthetic compounds for medicinal use. They are advertised on the advertisement pages (and sometimes in the clinical articles) of your journals either under trade names which give no clue to their chemical composition or under names of a "pseudo" chemical jargon—a camouflage to deceive the ignorant. Few of this host of synthetic drugs survive the searching crucial test of sustained clinical trial. It seems advisable to exercise caution in employing these compounds of unknown chemical composition and of little known physiological action. Similar caution is necessary in using ultra-violet light, since we are as yet very ignorant concerning the effects of ultra-violet rays.

Sulphur.

I can only refer briefly to two or three drugs which have caused fatalities after administration. Sulphur is a very old remedy; being easily procured it has been and is frequently used by animal owners and attendants. A lump of brimstone in a dogs' drinking water can do no harm, but large doses of flowers of sulphur have frequently caused fatal damage to horses and sometimes to pigs. Although "flowers of sulphur," according to the *British Pharmacopœia*, should be sublimed sulphur, most of the samples sold as "flowers" which I have examined consist of ground sulphur. In old veterinary literature reference was often made to "black sulphur." This was the powdered black residue remaining in the retorts after the distillation of sulphur and contained arsenic and other impurities; it was often used by horse attendants, sometimes with fatal results to the horses. It seems probable that the active agent in this black sulphur or "*sulphur vivum*" was the arsenic. I have examined a number of specimens of "black sulphur" sold by chemists at the present time and have found that they all consist of ground sulphur and charcoal. "Cobalt," apparently another name for the old "sulphur vivum," is sold in some French pharmacies, but the modern mixture appears to be white arsenic and charcoal.

The possible damage to horses following dosage by large amounts of sulphur may be illustrated by two examples. Six farm horses exhibited symptoms of abdominal pain,

groaning, blowing and profuse diarrhœa. The temperature was 102° F., pupils were dilated and heart beats intermittent and irregular. Five recovered but the heart did not regain regularity for forty-eight to sixty hours. The sixth died after an illness of sixteen hours. *Post-mortem* examination revealed enteritis and nephritis. I separated approximately four grains of sulphur from one ounce of stomach contents.

Seven horses were discovered to be suffering from acute abdominal pain, purging violently and sweating profusely. The pulse was fast and wiry. Two stallions died, the *post-mortem* examination showing intense inflammation of the villous portion of the stomach, and of the intestines; in one case there was a considerable amount of kidney irritation. Sulphur was separated from the stomach contents to the extent of approximately ten grains per ounce.

CROTON SEED.

Croton seeds contain a toxalbumin, crotine, analogous to the ricine present in castor seeds. The oil of croton seeds, croton oil, contains a glyceride, cotonolein, which in the presence of the alkaline fluids of the intestine is resolved into glycerine and the sodium salt of crotonoleic acid. Both the free acid (a certain amount of which may be present in old croton oil) and its sodium salt possess very irritant properties and for this reason croton oil is particularly toxic to horses and cattle. One example recently encountered may be quoted: Three horses each received a proprietary purgative powder, eighteen hours after the administration of which ensued severe purgation for two days. The animals refused food, temperature was inclined to be low, eye membranes were cloudy and yellow, breath offensive, tongue dirty white, nostrils purple spotted and much inflamed, mucus discharge from nostrils and eyes, heart beats 90 per minute. A powder was submitted for analysis and was found to contain crushed seeds from which I separated approximately 10 minims of croton oil.

CARBON TETRACHLORIDE.

The use of carbon tetrachloride as a remedy for liver fluke in sheep is attended by some risk of fatal intoxication. A flock of ewes (158) was divided into three batches; one lot consisted of the very poor ones (15), a second of those in fair condition, and a third of those in good condition. A veterinary surgeon administered two capsules (each containing 2 c.c.) of carbon tetrachloride to each of the poor ewes and one to each of the others after fasting. Eighteen sheep were found dead the next morning, but only one of the poor ewes. Three sheep died during that day, three on the following day and one three days after dosing, that is to say, twenty-five ewes died in all. The symptoms were disinclination to move, tympanites, listlessness and blood stained discharge from nostrils; the fæces were coated with blood and mucus. *Post-mortem* examination revealed blood-stained froth from nostrils, acute gastro-enteritis, inflammation of pleura, trachea and bronchia. It is interesting to note that the poor animals appeared to tolerate the drug best, although they received double the dosage administered to the stronger animals. Jones and Montgomerie state that some observations indicate that cattle tolerate carbon tetrachloride more poorly on the re-dosage. (*Record*, 1928, p. 269.) Attention may also be directed to their observation (p. 270) that "the immediate effect of dosage was strange, since, in contrast to what follows the first dose, the three weakest calves showed no toxic symptoms, while slight toxic effects, drowsiness and inco-ordination, were seen in the case of the two stronger calves."

In April of this year ninety-eight sheep were each given one capsule containing 1 c.c. of carbon tetrachloride. After an interval of two hours they were turned out to grass. Eight hours after dosing two sheep were dead and two hours later two others died. By mid-day on the following day sixteen had died and in the course of the next three days seven more died. The owner stated that the animals seemed to become gradually paralysed, that some of the others were very ill and that some had lost their milk. *Post-mortem* examination showed petechial lesions in the abomasum and bowels. A few of the capsules were submitted for analysis, but I was unable to detect any impurity in the small quantity of the drug available. In connection with the occasional lethal action of carbon tetrachloride, the mode of administration appears to be worthy of consideration. The common method of dosage of sheep in this country is the administration of the pure drug in gelative capsules. If the capsule is chewed, it seems possible that some of the mobile volatile liquid may be squirted from the capsule and find its way into the respiratory organs. Melck recommends that 1 to 2 c.c. should be mixed with about 10 c.c. of milk or linseed oil in a syringe, which is then slowly emptied into the mouth. (*Journ. S. Africa Vet. Med. Ass.*, 1927, *1*, 42.)

Sheather administered the drug in conjunction with liquid paraffin to lambs suffering from parasitic gastritis, and in one instance a lamb received 50 c.c. of each of these liquids without a fatal result. Roger, Jouveaux and Plateau mixed 50 grams of carbon tetrachloride with 3 litres of water and stirred this mixture into 6 litres of bran; the resulting meal was consumed by a horse in about forty minutes in the morning and in about twenty minutes in the evening. (*Bull. de l' Acad. Vétér.*, 1928, *1*, 43.)

I take this opportunity of again asking veterinary practitioners to forward for analysis the unopened carcases of birds or small animals or, if this is not possible, the *unopened* stomach and viscera. Labelled specimens of stomach walls and contents, intestines, liver, kidney and urine of the larger animals should be submitted. I have much pleasure in thanking those who have furnished me with histories of cases of which I have made wide use in this review.

DISCUSSION.

The PRESIDENT (Mr. W. A. Dickinson) asked if it was possible to get linseed cake poisoning when the cake was fed dry.

Dr. CLOUGH said that he thought there was little risk of damage if cake was fed dry, as ingesta and gastric fluids appeared to have a retarding effect on the liberation of hydrocyanic acid from the glucoside.

Mr. DICKINSON stated that he asked that question because some time ago a client of his had three calves die in a few days after only a few minutes' illness. He saw none of them alive, and after *post-mortem* examination the only thing he could suspect at all was the cake, which was fed dry. He forwarded some of the cake to an analyst, who said it was capable of causing poisoning. He did not remember the amount of hydrocyanic acid yielded by the cake, as the analyst's report had been sent to the owner of the calves.

Mr. E. PORTER-SMITH said that as they were discussing the potentially-poisonous properties of linseed cake, he might relate an instance illustrative of the extreme importance of discretion.

A man who was originally a cart-horse contractor went into farming. He was a most illiterate individual, and he employed his almost equally illiterate brother as foreman. The latter rang him up one morning and told him that as he had run out of feed for the calves he had told the milk lad to bring something back after his round for the calves, as they had had nothing that morning. The lad brought him back a sack of linseed cake meal. The foreman told him (the speaker) that he mixed it with water from the boiler and started to feed the calves, and, he added, "While I was feeding them three died. What am I to do?" I replied, "Stop the feed; how many is it now?" Receiving the answer "five," he went out and found, in addition, five showing paralysis and double respiration; in fact, all the symptoms of hydrocyanic poisoning as given by Dr. Clough. He went to the place where the man had mixed the meal and got him to shew him how he had done it. They were very successful in getting compensation in that case, and he (Mr. Porter-Smith) went to a deal of trouble to get the matter settled out of Court, because he knew that his illiterate client would have injured his case in the witness box. He told him, therefore, to keep his mouth shut and he took the matter up with the firm who supplied the meal. His client had lost fifteen calves in twenty-four hours, out of a total of thirty animals. He went to the agent who supplied the meal and told him that there had been an accident of some description, but that it had been kept very quiet. The next day the manager came down from the mills, and he took him down to the farm and showed him the meal, also telling him that he could see the calves and take the stomach contents away if he so desired; also that the firm would have to pay compensation, as there was no possible doubt as to the cause of death of the calves, for they had had nothing to eat the morning they died except the meal supplied by his firm, and they began to die as soon as they were fed on it. The manager was a long time before he would admit anything, and then said "Don't you think these calves have starved?" He (the speaker) replied that it was unfortunate that the calves had taken the meal on an empty stomach, but that an empty stomach did not produce poisoning. A week passed, and then they got a message to say that the cake had been analysed in London, and that the representatives of the firm were coming down. They came, and said everything they possibly could against the case for compensation. When they had finished, he said: "I am simply going to tell you this, that if I go into the box and tell a jury from the County of Lincolnshire what has happened, you will not only have to pay £150, but you will probably lose £1,000 from the county before you have finished." They instantly agreed to pay £150, and there was no law in the case. He was very much impressed with what Dr. Clough said about the manufacture of those cakes. That was not linseed meal; it was linseed cake meal, and it was mixed with water that had boiled during the morning, but which was not boiling when the man mixed the meal. That was rather a weak point in his client's case, had they gone into Court. He obtained the information that the escape of steam in pressing the cake affected it in some way so that when it was broken up it contained a large amount of hydrocyanic acid. Those animals just happened to get the very bag in which was the cake with that high content of prussic acid.

Mr. F. L. GOOCH said he desired to take the first opportunity given him to thank Dr. Clough for bringing forward a paper of such interest to the ordinary country practitioner. (Applause.)

There were several questions he would like to ask him, and the first was: had Dr. Clough ever had any experience of poisoning in sheep from the white clover seed?

There was one thing that they, in the care of their domesticated animals, had to take into consideration, and that was the instinct of the animal in most cases to avoid poisonous plants, and practically every one of those poisonous plants they saw in the fields was not eaten in its green state by the animal. They got the cases when the poisonous plant was either wrapped up in the hay or in something else that was given to the animal in its dry state. They would find that no equisetum or ragwort was eaten in the field, when it was growing in large quantities, unless the animal could get nothing else. That was contra-indicated by Dr. Clough saying that the poisoning by bracken was due to the eating of the green bracken. In hundreds of cases they found that bracken was used for bedding instead of straw, and they would often find animals eating the dry bracken without any ill effect. It had been suggested that poisoning by new-mown hay was due to coumarin, but was it not due to poisonous plants getting into the hay, and not to the hay itself?

He had a striking case of poisoning by green red clover, when it was fermenting. There was a large waggon of this clover at the farm, and there were three deaths. He wished to ask the essayist if he did not think that some of the fatalities that had been accredited to *Lathyrus sativus* were, in some instances, due to the fungus which was often found in those seeds, especially when they had been kept for a long time. He had seen bad cases of gastro-enteritis from that cause.

The case presented by Mr. Porter-Smith was certainly an illustration of the necessity for farmers to associate themselves by joining some such society as the Royal Agricultural Society or the National Farmers' Union, who would undertake the whole of the legal expense to their members in cases in which there had been either a contract broken by there not being the proper percentage of oil in cakes, or poisoning from any of the feeding mixtures supplied to them. That was particularly important now that so much artificial feeding was being carried out.

As regarded black sulphur, many of the old chemists used to sell a preparation of antimony and black sulphur. Had Dr. Clough met with any cases of poisoning from tobacco? It was the custom, when he was a lad, for waggoners to give a horse two ounces of ordinary smoking tobacco for worms. One man got two years imprisonment for giving it to horses, eight of which died.

Mr. J. H. POLES asked Dr. Clough if he could tell them what particular grass or weed in wash hay it was that made hunters into roarers. He had had several cases, and he therefore never used it now, but he had bought his experience.

Mr. PORTER-SMITH remarked that most of the members would be aware that there used to be in Lincolnshire an Association for the Prevention of Horse Poisoning. Since the war that Association had dissolved, but he had been employed by them on some occasions to go and examine horses that were suspected of being poisoned by arsenic. There was never any doubt as to the diagnosis of arsenical poisoning in the horse; the symptoms were quite characteristic. In his early days Lincolnshire chemists had a peculiar habit. A young waggoner would go to a chemist and ask for some "markbury," as arsenic was termed by them, and if the chemist was discreet he gave him something that passed for arsenic with a lad who did not know arsenic when he saw it—it was usually bicarbonate of soda—and the fellow would carefully give his horse "as much as you can get on a threepenny bit"—(laughter)—the old dose. As his horse was not thriving very much on it the waggoner would increase the dose, and trouble used to arise when he went to some other chemist and that gentleman gave him the poison.

Mr. W. W. LANG, having expressed his thanks to the essayist, stated that he was struck with the very great importance of reporting all those cases. He had a case some time ago in which five horses died, and he sent to the College condition powders which the animals had been receiving, and which he did not supply (laughter)—and Dr. Clough reported the presence of a large percentage of black sulphur. In these cases he had a great difficulty in distinguishing what the actual poison was, because the symptoms, as he saw them, appeared to be those of arsenical poisoning. The difficulty was to get to know

quickly enough what the poison was, in order to apply the suitable antidote. He did not know, though perhaps he should, what was the antidote to black sulphur, so he would be glad if Dr. Clough would tell him.

Mr. PORTER-SMITH related a case in which a man lost a number of cows through sulphur poisoning. The farmer had been in the habit of dosing his cattle (they were valuable pedigree stock) with sulphur, and on that occasion he had not given his new foreman instructions, and the man had only the vaguest idea as to how to give it. That was a case in which ordinary sulphur was used, but he was wondering if it might have been the powdered sulphur instead of the flowers of sulphur.

Mr. GOOCH mentioned that, as a boy, he was a breeder of guinea-pigs and also used to garden. He threw out some old stuff from the garden to the guinea-pigs and in it there happened to be *digitalis purpurea*. In the morning twenty-nine of the guinea-pigs were dead. They ate it ravenously.

Mr. T. KNOWLES asked Dr. Clough if he had had any experience of poisoning with carbon tetrachloride in horses. Once he gave one ounce to a four-year-old in two pints of water, as a drench. The animal died about three days afterwards, never swallowing anything after he had received the drench. On another and subsequent occasion he gave two ounces by the stomach tube in two pints of water, and that animal also never swallowed anything else and also died. He had been advised to use it by someone at the Royal Veterinary College.

He had another case to relate which might be of interest to them; it occurred in March, and Mr. Lockwood was in it as consultant. One afternoon a farmer came in who said he had forty or fifty beasts in three yards, and that in the morning they were all right, but that early in the afternoon he found three dead and one dying. He (the farmer) suspected anthrax. The animals were having nothing but mangles, wheat straw, and Egyptian cotton cake. He (Mr. Knowles) went to the yards, and while he was making further enquiries another beast dropped dead. They were heifers running with the bull. A *post-mortem* was made and, finding nothing but slight inflammation of the fourth stomach, they came to the conclusion that the fault lay with the cake. About a week after that two more beasts died. They put them all out to grass, except two that were having nothing but hay and mangels, and then one of those died. The analyst reported that the contents of the first stomach yielded ·18 per cent. sulphate of ammonia, and ·035 superphosphate. The only way in which it could be ascertained that the beasts had had the sulphate of ammonia was that it was found that the mangels had been dressed with ammonium sulphate and superphosphate. Curiously enough, the one beast that they left for dying was perfectly all right the next morning. They had had no more trouble since the animals were turned out to grass.

Dr. A. LESLIE SHEATHER, who was present as a visitor, responding to the President's invitation to him to take part in the discussion, said that perhaps Dr. Clough might give them the facts of a case which they had jointly before them only ten days previously. So he would content himself with saying, in regard to it, that it was a case in which some cattle were turned out in a field at the far end of which there was water which they drank, and within half an hour two were found dead. The local inspector asked him to examine smears for anthrax, but none was found.

With regard to mouldy food, many years ago, at the College, the question arose about some oats which were said to be mouldy having caused the death of some horses. Sir John M'Fadyean obtained some oats from a corn chandler's and planted them in bowls in a medium composed of bread. It produced a fine crop of moulds, and he fed these to a pony, but could not produce the slightest ill effect.

Concerning the story of the calves fed on linseed cake meal on an empty stomach, it was a fact that you could starve a bovine for a long time and yet be unable to empty the rumen. You could not, in fact, entirely empty the rumen while it was alive, so that he thought that the question of the calves having been a few hours late for their feed would not have had the slightest effect upon them when the poison was given to them. He would remind them that they must make certain exceptions to Mr. Gooch's rule that animals would not eat poisonous plants, on account of their instinct not to do so, for their ingestion of yew, for instance, was common knowledge.

Mr. GOOCH said that he quite agreed with Dr. Sheather that bovines would eat yew when they could get at it. It was very sweet. He did not think, however, that Irish yew was poisonous, for he had seen bullocks eat it without any ill effect.

Mr. G. LOCKWOOD expressed his great appreciation of the paper and enquired of the essayist if there was any risk in the practice, very common in that district, of giving a macerated solution of linseed cake to horses. In a good many stables in the winter time there was placed a large tub with linseed cake in it, and the linseed was slowly macerated with water. What appeared to him to be rather risky about that practice was that the tub was never cleaned out from the autumn to the following spring, and there was thus always a mass of old wet linseed clinging to its sides. Yet he had never heard of any trouble following that mode of using linseed cake solution.

THE REPLY.

Dr. G. W. CLOUGH, replying to the points raised in the discussion, said that he was very interested in Mr. Porter-Smith's example of poisoning in calves by linseed cake meal.

Mr. Gooch asked him if he had encountered instances of sheep being poisoned by ripe white clover seed. He could not say that he had had any experience of that food being poisonous. He might just mention that there was a recently-published book entitled "Poisonous Plants on the Farm," by H. C. Long. It cost only 2s., and he thought that they would probably find it a very interesting book, chiefly because of the illustrations. It was published by the Ministry of Agriculture.

Mr. Gooch had raised the question of the instinct of animals in feeding and, fortunately, animals did seem to have an instinct not to eat green poisonous plants. But that instinct did not seem to be universal, for undoubtedly cows as well as sheep did sometimes eat green poisonous plants. They had examples of hemlock and belladonna poisoning, in which there was not the slightest doubt that the animals had consumed the green poisonous plant. Still, in the cases of bracken, ragwort and equisetum, poisoning by the green plants was not at all common in this country, unless they had a very dry season, when there was very little grass in the fields, and then the animals might turn to those poisonous plants. With regard to new-mown hay, Mr. Gooch had asked if in cases of alleged poisoning thereby it might not be that there was a poisonous plant in it which was causing the damage. In the Swiss case he (Dr. Clough) had mentioned, it was stated that the hay was very carefully examined for the presence of poisonous plants, but no poisonous plant was found in it. He thought that fermentation did produce trouble sometimes. Did Mr. Gooch have trouble after mouldy hay had been eaten? (Mr. GOOCH: "It does cause broken wind.")

Mr. Gooch had also asked if in some instances, the seeds might contain a fungus. They might do so in some cases, but not in the case of *Lathyrus sativus*, which was certainly poisonous. In the seeds (produced) which were a sample of the seeds which caused injury to a number of horses, he could only count about three foreign seeds in one or two hundred. Again, in reply to Mr. Gooch, he had had no experience of tobacco poisoning in animals; he thought that possibly excessive tobacco smoking in students might produce—(A Member: "Lethargy")—Yes, lethargy. (Laughter.) However, that question of nicotine poisoning was one which they always had carefully to bear in mind, because this substance was used as spray on fruit trees, and the foliage beneath the trees might become contaminated.

He was sorry that he could not answer Mr. Pole's question. In reply to Mr. Lang, the poisonous properties of sulphur seemed to be due, in part at least, to the generation of

hydrogen sulphide. He could not think of any suitable antidote to sulphur. Possibly castor oil might be of service.

Mr. Knowles' cases were very interesting. Mr. Ware told him that in India he had given carbon tetrachloride to horses on many occasions, and never with a fatal result. (Mr. KNOWLES: "Mr. Ware gave me the doses and the drug was chemically pure.") Those different effects of carbon tetrachloride were very mysterious. He thought Mr. Knowles' second case they must consider a mystery until the final report was received, because he could not think how moderate amounts of sulphate of ammonia could be poisonous in the way which he had described.

Dr. Sheather had mentioned a recent case of poisoning in cattle, in which they were both interested. There were two fatal cases out of a number in a field, and those two cows must have died very quickly indeed, because they were found dead just by a stream where they had been drinking. So rapid, in fact, must death have been, that it was at once suspected that anthrax was the cause of death. That having been negatived, a chemical analysis was made, and hydrocyanic acid was suspected. After carefully testing for the presence of prussic acid in the various specimens submitted, distinct evidence was obtained in the rumen contents of a very minute amount of this acid. The owner told him that he had taken samples of water from the stream, and he (Dr. Clough) asked him to let him have them. He found that hydrocyanic acid was present in the water. The water from the stream had been evidently polluted with cyanide from a factory where photographic chemicals were dealt with, so that they were able to prove in that case that the damage was due to hydrocyanic acid.

He had been asked whether there was any risk incurred by feeding linseed cake, macerated with water, to horses. He had had no cases himself, but horses had been poisoned by hydrocyanic acid from linseed cake. Major-General Sir John Moore had told him that during the war a number of horses of the English army was poisoned by foreign linseed cake yielding hydrocyanic acid with water, but that the damage at once ceased when they prepared it by boiling with water.

Dr. Clough concluded by thanking the members of the Lincolnshire Division for the kind way in which they had received his paper.

FOOT-AND-MOUTH DISEASE RISKS.

"A point of importance in connection with the foot-and-mouth disease problem was suitably emphasised at the last meeting of the Council of Agriculture," states the Agricultural Correspondent of *The Times*. "From the statements that had been made regarding the time the virus of the disease could remain active in carcases of infected animals, it was commonly supposed that the 43 days mentioned in the case of chilled meat and the 72 days in that of frozen meat were the limits of the risks involved. That is not the case. Sir Merrik Burrell said that those periods represented the duration of the interrupted tests, and this was confirmed by Mr. Jackson, of the Ministry of Agriculture. It was added by Lord Stradbroke, for the Ministry, that the researches are being continued. There is something to be said for the view that the periods mentioned are sufficient to imply inability to reconcile the shipment of infected carcases with safety to the health of the community. The subject is of basic importance, and the further investigations proceeding at Pirbright will be followed with keen interest and expectations of far-reaching results. But, as Sir Merrik Burrell insisted, whatever the outcome, it is inconceivable that there should be more lenient treatment for the imported dead meat than there was for the living animals at home. Hitherto we have been more exacting in regard to living stock than to the carcases coming in from external sources—a serious and inexcusable anomaly detrimental to home production and the national health."

Urine.

DISCUSSION ON MAJOR HAMILTON KIRK'S PAPER.

The following is a report of the discussion which took place at a meeting of the Central Division N.V.M.A., held on June 8th, on the paper on "Urine," by Major H. Kirk, which was presented to the meeting and which was published in last week's *Veterinary Record*.

Prof. A. R. SMYTHE: Major Kirk has gone to a great deal of trouble in formulating his paper, and we must all congratulate him on his achievement. I shall endeavour to supplement some of his statements.

One usually suspects that some abnormality exists in the composition of the urine when certain fairly constant, concomitant symptoms are observed in the patient.

Analysis of the urine in this type of case may afford information of value; in a few instances unassailable evidence of renal disease is obtained, but, in the majority, nothing of diagnostic importance is found in connection with the urine. In chronic interstitial nephritis, unless the analysis is repeated or accompanied by a microscopical examination, there is a risk of an incorrect diagnosis being arrived at. The usual, casual, qualitative examination for albumen and sugar is insufficient.

Certain difficulties arise in connection with animals. In all breeds it is hard to obtain precise information as to the diurnal quantity of urine voided, a factor of considerable importance in certain forms of renal and constitutional disease. In dogs, especially in the female, it is troublesome to obtain samples of the urine in sufficient quantity for proper analysis, and this is one of the chief reasons why analysis is not more popular.

The essayist, in enumerating the various tests, has not signified those he would recommend us to adopt, neither has he pointed out the various fallacies which may arise and confuse the readings. When albumen has been shown to be present, Esbach's albumenometer may be resorted to: the technique is extremely simple and the quantity of albumen present can be quoted as a percentage. Mucin may be detected by the ring test, the urine is superimposed on a saturated solution of citric acid and a cloud is observed above the line of function of the two liquids. Its presence in excess points to irritation of the bladder or genito-urinary tract.

Of the tests for sugar, Benedict's or Fehling's are the most satisfactory.

Saccharimeters may be obtained at a small cost; they are graduated in percentages, which vary with the amount of urine required to reduce a fixed quantity of Fehling's. Here again, it is far more satisfactory to quote percentages than to employ terms signifying indefinite quantities. For more exact work fermentation tubes are available.

Lactose may be present in the urine of lactating animals and, like grape sugar, it reduces Fehling's. It may be differentiated by the fermentation test.

I dislike the test given for the presence of pus. It is far more satisfactory to add a little weak acetic acid and examine microscopically for pus cells. The presence of other abnormal elements may be sought at the same time.

Epithelial and blood casts are usually indicative of early and acute parenchymatous nephritis, whereas fatty and waxy casts point to long standing renal disease with degeneration of the cellular elements; granular casts occur in the more chronic forms of renal disease.

Hyaline casts occur in all forms of nephritis and sometimes in health.

When abundant, casts are to be regarded as an indication of serious disease; they are not always easy to detect, and they sometimes disintegrate in the urine.

Renal epithelial cells are of grave significance. They are spherical, rather small, and may be grouped in masses. In chronic disease, they often undergo degeneration, and may become crowded with fat globules. The bladder yields squamous cells but transitional and tailed forms also occur.

After the administration of diuretics the urine is secreted in increased amount; it is pale and free of albumen and sugar. A somewhat similar condition is present in polyuria or diabetes insipidus, an irregularity perhaps more common in the horse and usually arising out of dietetic errors such as mouldy hay or fermented oats; here the cause is toxic and probably due to diurectic bodies. A similar condition is observed in chronic bacillary infections, such as tuberculosis.

Dogs also suffer from a form of polyuria—marked thirst is a constant symptom; possibly alimentary intoxication arising out of a chronic dyspepsia and an impaired gastric function is a partial cause.

Albumen may be present in the urine from transient causes as violent exercise, chills, after partaking of excess of albumen; in the so-called physiological albuminuria in pregnancy, pyrexia, and certain forms of brain disturbance. No casts are present. Of more importance is the albuminuria arising out of renal congestion and associated with cardiac disease, cirrhosis of the liver, ascites and other causes. If the condition is not relieved nephritis may ensue.

Acute parenchymatous nephritis is not of common occurrence, but is sometimes encountered in the dog. Albumen is present in large quantities and in extreme cases the urine will coagulate on boiling. The urine is scanty in amount, and pigmented from the presence of red blood cells; epithelial, blood and hyaline casts occur and free renal epithelium may be present; the excretion of urea is imperfect.

In chronic parenchymatous nephritis the same description holds true in a modified degree.

In interstitial nephritis albumen may be present in small quantities or at times entirely absent; the quantity of urine may be very much increased but the solids are deficient—the colour is clear or pale, casts are usually of the hyaline or granular variety and renal epithelial cells may be present. Urea excretion is interfered with and, as in other forms of nephritis, symptoms of uræmia may be observed. The condition is relatively common in the dog.

In amyloid kidney albumen is very plentiful, but this form of degeneration is extremely rare in animals. Glycosuria may result from the excessive ingestion of sugar, from endocrine irregularity and especially in insulin deficiency; the latter condition is associated with saccharine diabetes. The urine is pale in colour, increased in quantity and the specific gravity is very high; later in the disease albumen may be present, as may diacetic acid and acetone. The condition is then known as acetosis or ketosis and indicates a diminished PH. of the blood arising out of the incomplete oxidation of fats, due to a carbohydrate deficiency. Amongst animals, this condition is probably commonest in cattle, but it also occurs in the dog in the acidosis of delayed chloroform poisoning. I should like to know the essayist's opinion as to the frequency of saccharine diabetes in dogs.

With hæmaglobinuria Major Kirk has dealt: it is a condition most commonly encountered in cattle practice.

Papillary outgrowths in the bladder may be a cause of hæmaturia.

The quantitative estimation of urea in urine is a simple process, but since the percentage present varies with the diet it is not of great value unless one can obtain samples over long periods and compare with the amount of protein ingested.

The quantitative estimation of blood urea is a complex calculation only suited for laboratory workers.

Certain kidney efficiency tests are available, but so far as I am aware they have not found favour in veterinary medicine.

The essayist has said very little about calculi; has he knowledge of any special condition affecting the urine which predisposes towards the formation of these bodies?

I should like to thank Major Kirk for coming here tonight and for his interesting paper.

Dr. G. W. CLOUGH said that he noticed that Major Kirk stated that he presented that paper not in the guise of an urologist but simply as a clinician. He (the speaker) did not know what an urologist was, but it did not sound a very pleasant occupation. (Laughter.) As Major Kirk had brought the matter forward solely as a clinician, he thought it was very unfortunate that he had not brought before them some cases to illustrate the value of urine analysis. Major Kirk could have described to them the results of his analyses, and then have told them what conclusions he had deduced from those results. Major Kirk had said that a fee could be charged for the tests carried out. If the test consisted of determining the specific gravity, it might impress some animal owners, but not if they were very intelligent.

He was very much surprised that Major Kirk should have omitted allantoin. Uric acid was not present in the dog's urine, its place was taken by allantoin. It seemed to him it was a very interesting fact—that in the dog's urine allantoin was present. He noticed that Major Kirk said that certain breeds of dogs (*e.g.*, Dalmatians) were stated to have a high uric acid elimination, but that he knew of no reason for that. Neither did he (the speaker), although he believed it had been reported in America, and it was certainly exceptional if it was the case.

When they came to the examination of the urine, Major Kirk said that chemical examination, although of great importance, could never alone lead to a correct diagnosis. He (Dr. Clough) was quite aware that that was what was said by Weitzmann in his book. Major Kirk evidently agreed with that, but in a case he had a short time ago from Mr. Awmack King, of Harrow, he found 7 per cent. sugar in a bitch's urine, and in the urine of a dog from Mr. Rix he found 9 per cent. He would like to ask Major Kirk if those results were not sufficient in themselves for a diagnosis of diabetes to be made. Those figures were much higher than Major Kirk gave as the limit of sugar content in the urine of a diabetic dog, his figure being 4 per cent.

With regard to examination of the urine, the essayist said: "These tests must be made first with a view of determining the character and amounts of the normal constituents of the urine." He (Dr. Clough) did not know why Major Kirk recommended them to make those tests; he did not really think they would have time to perform them and when they had made them he very much doubted whether, having found these constituents, the tests would have proved worth while. But in that connection it was interesting to observe that the method commonly used by the medical profession was that devised by Russell and West. Dr. Russell was at one time lecturer in Chemistry at the Albert Veterinary College, London.

Then certainly tests must be made to determine the presence of any abnormal constituents, and here he agreed with Professor Smythe that some mention might have been made of the quantitative determination. In his opinion that was exceedingly important, especially quantitative examination over a period of time.

Major Kirk said: "The specific gravity of urine is quite important, as it is an indication of the nature and amount of the urinary contents." He thought he might have elaborated that statement and showed them how it was important. A few lines further down they found the normal specific gravities given showing a huge variation; therefore he could not quite see how the specific gravity could be "quite important" in a pathological condition.

Then, later on, they had some tests given. First of all, the tests for sugar. There was the Moore-Heller test, which was described fully, and then they were told "it is only a tolerably reliable one, but in many cases will answer the purpose." This test was, he thought, absolutely obsolete. The second was a copper test—Trommer's test. That again, Major Kirk said "was not quite a reliable test," so they need not trouble themselves about that. Then they had Fehling's test, and the essayist told them how the Fehling's solution was made, but unfortunately even there the directions were not explicit. No concentration of the potash solution was specified, and he could assure them that failure was exceedingly probable unless they knew the concentration of the potash they were going to use. Major Kirk might have told them that that, again, was not an absolutely reliable test, because there might be

a slight reduction with no sugar present, and there might be no reduction even with a small amount of sugar present. If they carried out the test as given by Major Kirk they would generally find a little reduction. Therefore, there were many pitfalls in urine analysis, and unless one had a certain amount of experience one might readily come to some erroneous conclusions.

Concerning the quantitative examination, which Prof. Smythe had mentioned and Major Kirk had not, they had the Fehling method, and the fermentation method, but a very accurate method was the polarimetric method, though it was quite out of the question for veterinary practitioners, as the apparatus was expensive. Then they came to the tests for albumen. Here, again, was a pitfall because in the dog's urine, which contained a high percentage of urea, they frequently obtained a precipitate of urea nitrate in using the nitric acid test for albumen. Again, if uric acid was present one sometimes obtained a precipitate. There was a very good test for albumen—the salicyl-sulphonic acid test—which Major Kirk did not mention.

In the case of uric acid, triple phosphates, etc., what were really required were some micro-photographs, so that one could compare the appearances that had been obtained by previous workers with those which one observed under the microscope. If one wanted to identify uric acid the best test was a chemical test—the murexide test.

Concluding, Dr. Clough said that he was sorry if his contribution to the discussion sounded rather adverse to the paper, but, being a chemist, he thought it his duty to point out things in the paper that appeared to him to be incorrect. He would be glad if Major Kirk would give them instances of cases in which urine analysis had proved to be serviceable in diagnosis. (Applause.)

Mr. G. H. LIVESEY remarked that he had very little to say on the paper, and he only regretted that what he would have to say would not be constructive criticism. He could, however, say that in practice he tried several times to make a urine examination to see if it would help him, but he found that his results were erratic and unreliable, and he soon came to the conclusion that he was not sufficiently skilled. He thought it was better to leave such examinations in the hands of an expert.

He would like to know two things. Major Kirk said: "Some of the best known constituents of normal urine are water, ash, urea, etc." He should like to know what the essayist meant to convey by the word "ash"—it did not convey very much to him. He certainly had never found ash in normal urine. Major Kirk also spoke of "organic and inorganic sulphur," he presumed he meant organic or inorganic sulphur *compounds*. There was no such thing as "organic sulphur."

Major Kirk had, he thought, fallen into a pitfall further on, where he stressed the great point that urine was not a secretion but an excretion and, having made that point, he continued in the rest of the paper to speak of it as a secretion. That was evidently a slip, presumably made in the hurry and pressure of writing a paper like that while carrying on a practice.

In that connection, he thought Major Kirk was very sporting, in giving them that paper, although, as they knew, he was busy, but he was always to be relied on, and he thought they owed him their thanks. (Applause.)

Dr. A. LESLIE SHEATHER stated that there was a point upon which he would like to ask information. He was rather interested in what Major Kirk had to say in regard to tubular casts. The essayist said: "Casts are probably the products of an albuminous exudation from the blood-vessels, with the addition of swollen and destroyed epithelia." He would like to ask him whether that was the only type of cast which might be excreted in urine. He had said that "their appearance in urine was always of the highest diagnostic importance, and, if found in any amount, indicated the presence of a croupous or parenchymatous nephritis." Did he further refer to any tubular casts—or did he refer to the particular type of cast he had mentioned? He would like to have an idea of what Major Kirk meant by the statement "If found in any amount," and he would like to ask him why he found it necessary to use a magnification of 400 diameters in the detection of epithelial casts, which magnification was sufficiently high to make a tubercle bacillus quite visible. He desired to get an idea from Major Kirk as to the size of the tubular casts to which he referred.

Mr. W. PERRYMAN expressed the view that Major Kirk had given the Society a very exhaustive paper on urine, and they must thank him for the amount of detail he had embodied in it. He must have expended a great deal of time in collecting all the facts he had put before them. For that reason they appreciated the effort he had made for the Society. (Hear, hear.)

The paper dealt largely with the chemical side, but he would have liked to have heard something of the pathological side, also what deductions he would have drawn from his discovery of the various abnormal constituents in urine in different cases. He thought Major Kirk had certainly left out a good deal. He should have given them his pathological conclusions from the chemistry of the urine examined. He had also dealt more with the human subject than with animals.

As far as the chemistry of urine was concerned, he did not think that many of them were in a position to dispute the essayist's statements or those of authors—they had to take the analyses given in most of the textbooks as being correct, as having been done by expert chemists and, as Mr. Livesey and others had said, he thought they could not do better than rely upon the expert analytical chemist.

Referring to the terms of the paper (Mr. Livesey had already made some mention of this) the essayist wanted them to agree with him that urine was an excretion and not a secretion. He certainly thought it was more of a secretion than an excretion, although some of the watery constituents might pass through by infiltration from the glomeruli and renal tubules. No doubt some chemical metabolism took place. He believed it to be a fact that uric acid passed out in the form of phosphates of calcium, which were not in existence in the blood. A chemical change was set up, taking place in the kidney itself. They might meet each other half way and refer to urine as a secretion taking place in the kidney and an excretion from the bladder. Major Kirk might have dealt more fully with the nitrogenous equilibrium which was so often mentioned. The essayist had lightly touched upon the amount of proteid material passing into the blood and the amount passing out, as evidenced by the urine, but he might tell them whether he considered that protein, when taken in excess of the nutritive requirements, was in chemical combination with the various cells of the body before passing out of the system from the kidneys in the form of urea. Perhaps Major Kirk could enlighten them as to the latest knowledge concerning the point he had raised in regard to protein metabolism. They were told in the paper that polyuria indicated an excessive secretion and discharge of urine containing increased amounts of solid constituents. Later it was stated: "Diabetes insipidus is also known as polyuria, and is a chronic condition marked by great thirst and the passage of large quantities of the urine containing no excess of sugar." He (the speaker) disagreed with the assertion that diabetes insipidus was a chronic condition, so far, at least, as the horse was concerned. He termed it an acute disease: he had seen dozens of cases. They did, as was stated, get great quantities of urine with the consumption of mouldy hay. He had never yet seen a persistent case of diabetes insipidus, and he would like the essayist's idea as to the cause of diabetes insipidus in the horse. He thought it was more often due to fusty oats than to mouldy hay.

Could Major Kirk tell them by what methods the bacteria or moulds influenced the stability of the kidney, resulting in the passage of great quantities of water? In one place they were told that the specific gravity was great in diabetes insipidus, and in another that it was low—a direct contradiction. In reference to that, could Major Kirk give them any physiological reason why free iodine should be, as he believed all who had met with the disease said it to be, practically a specific for the condition? How did

free iodine cause a cessation of the flow of urine ? Was it due to an antiseptic condition acting on the bowel, or was it anything to do with the endocrine glands, particularly the thyroid, causing change in the metabolism of the food generally ?

In speaking of triple phosphates, the essayist said: "The combined ammonio-magnesium phosphates are alkaline sediments so frequently thrown down in the urine of cats. The material which is often the cause of urethral obstruction in cats is composed of triple phosphates." Could he give them any reason why that material was precipitated ? He (Mr. Perryman) desired to know if Major Kirk had seen those calculi in any but the castrated cat, and could he explain how the material should be precipitated in the castrated animal and not in the uncastrated one or in the female ?

As to glycosuria, it was stated "when glycosuria has been long in existence the animal begins to waste"—he thought Major Kirk might have gone a little further and told them what was the pathology of the liver in those cases, for he thought they would often find an enlarged and cirrhotic condition of the liver itself.

Dr. TOM HARE remarked that he was hoping to hear from the clinicians present how they approached the problem of taking the specific gravity of a small quantity of dog's and cat's urine, since it was not unusual to receive at the laboratory a quantity too small for the urinometer. He asked whether in such cases clinicians found the "dilution test" adequate. He was afraid a bias had been given in the discussion to regarding urine analysis as the sole concern of the chemist. He could not subscribe to that opinion. The chemist was a very valuable adjunct, but he was no more valuable than the pathologist. The pathological laboratory, he would suggest, was the place for a large part of the examination of urine, because the analysis was not by any means solely confined to chemical tests. He did not think this point had been sufficiently emphasised, and he would point out that in addition to the chemical analysis—quantitative and qualitative—there was required an examination of the general characteristics of the urine, coupled with a microscopic examination of the deposit. Then a bacteriological examination of the urine was required. Suppose they submitted, as Mr. Perryman would, their sample of urine solely to the chemist, what would the latter do if it were from a tuberculous cat with tubercle bacilli in the urine ? The vital constituent of such a sample of urine was the tubercle bacillus. He submitted that a chemical analysis was not likely to elicit very much information of value as to the presence of the tubercle bacillus, yet that was of vital importance to the clinician.

An acid urine, also, was full of interesting possibilities, in regard to its bacteriological content, particularly of the *Bacillus coli*. An evaluation of the types of *Bacillus coli* in acid urine and their association with pyelo-nephritis, especially in cattle, was required. Also, it was necessary to take account of the diphtheroid group of organisms, particularly in cattle. He hoped Dr. Minett, who was an authority on the diphtheroid group, would be good enough to offer them some contribution as to the pathogenic types of diphtheroids found in urine—whether the ordinary litmus test offered any indication as to what steps should be taken in making primary cultures of any particular diphtheroid.

He was very interested in Dr. Clough's observations about uric acid being replaced by allantoin in the normal urine of the dog. He was glad to have his assurance that he was speaking of normal urine, and not pathological, because there was a disease of the dog which he was now investigating in which uric acid crystals were to be found in the urine. He brought that point up because he could not support the contention that the evaluation of the crystalline deposit was not of importance.

If he were a general practitioner, listening to this discussion upon the refinements and difficulties, he would feel rather hopeless of ever improving his clinical concept of disease by examination of the urine. While such an attitude was reasonable, he hoped it would not be adopted, and he hoped that the essayist, in his summing up of the discussion, would indicate the most reasonable method of examining urine for the general practitioner. He would suggest to him that the refinements of the examination might be left to the analyst and the pathologist. He would also suggest that a simple routine examination upon the following lines might assist the practitioner, viz.: firstly, the specific gravity; secondly, the presence of albumen; thirdly, the presence of sugar—and here he was hoping that Prof. Clough would have told them some of those fallacies about Fehling's test, because it was a useful enough indicator in the hands of the general practitioner; fourthly, the examination of the deposit for casts and crystals; and fifthly, a litmus paper test to determine the reaction of the urine. By such a simple routine practice, in the course of a few years, coupled with a careful annotation of his clinical observations in his notebook, the practitioner could accumulate information of the utmost value to the profession. Here he would emphasise that clinicians as a whole were not making sufficient use of those indicators of disease, and in consequence the profession was being held back in its scientific concept of disease. Insufficent use was made of simple, routine tests in the examination of urine, blood, fæces and secretions generally—simple tests that any man could do with a little care.

Major-General Sir JOHN MOORE said he was afraid he could not offer anything very useful in discussion—the paper seemed to him more in the province of the biochemist and the pathologist—but perhaps he could approach it from the amusing side. Early in the paper he noticed Major Kirk's reference to the collection of urine from the dog. He (the speaker) owned a dog, and he was perfectly certain the animal could never be persuaded to void his urine on a tea tray. However, he dared say that Major Kirk was better informed on that than he was.

In regard to urine as a diagnostic agent he would like to mention—and Dr. Sheather would perhaps bear him out in that little matter, correct him if he was wrong—that in surra in camels in India the Sirwans or native camel owners and drivers diagnosed it by smelling and tasting the urine. There was, perhaps, something in it, because he thought the urine in surra had a peculiar smell about it, and it certainly had an altered appearance—a brick-red colour, which no doubt was due to the breaking up of the blood cells by the trypanosomes.

Professor Smythe mentioned hæmoglobinuria as being practically confined to cattle. He (Sir John) was certain that it existed in camels in the disease he had mentioned. Personally, he did not think that albumen in the urine was altogether a pathological matter, for he was led to believe that in operations, and perhaps before operations when it was quite common for a patient's urine to be examined, indications of the presence of albumen were usually to be found. He had undergone several operations himself and he was told by his surgeon that immediately before operation there was a little albumen in his urine. He would like to be informed what were the symptoms of uræmia in animals ? He presumed diagnosis was really chiefly a matter of supposition, as their patients were not able to tell them their symptoms.

He quite agreed with Mr. Livesey that it was very sporting of Major Kirk to come forward with such a paper upon a subject about which they should be much better informed than they had hitherto been.

Professor G. H. WOOLDRIDGE said that he came that evening with the full intention of not entering into the discussion on that paper, realising his own ignorance on the question of urine.

He admitted that he was one of those who had on very frequent occasions collected samples of urine and inflicted them upon Dr. Clough, and the latter had given him at times very useful information, but he realised the great pitfalls to which reference had been made that night, and not chiefly were those pitfalls to be referred to the paper and to Major Kirk, as they appeared to have been. The whole subject was full of pitfalls and he thought Major Kirk was to be complimented on his bravery in bringing

that subject forward for discussion, for he must have realised that there would be more destructive than constructive criticism.

During the course of the discussion there were one or two points that came into his mind. In the first instance, he was very interested when Prof. Smythe mentioned the presence of albumen in the urine in cases of heart and liver disease, and that notice should be taken of it as nephritis might ensue. He would suggest that in a considerable number of these cases nephritis was already in existence, and he thought one should be very cautious in asserting that one might prevent nephritis following such cases. He thought one had got it already in existence and note should be taken of it, otherwise it might become chronic or hyper-acute, resulting in a fatal termination.

The use of the analysis of urine was brought home to them every day. Only that week he had the case of a Bulldog brought in for pain in the lumbar region. At his first clinical examination he was unable to make up his mind if it was a case of nephritis or lumbago. It occurred to him that this was a case in which one would be helped in forming a diagnosis, if one knew whether or not albumen was present in the urine. Urine was collected, an examination was made, and there were no traces of albumen. That did not necessarily mean that there was no nephritis, but it certainly helped in the negative direction.

He was very interested indeed in what Sir John Moore had to say with regard to albumen not always being an indication of renal disease. It could be got with a copious egg diet, and when one had an invalid dog that had to be hand-fed with egg and milk in considerable quantities one should bear that in mind. The presence of albumen in Sir John's urine prior to operation had been suggested as being physiological; it seemed to him that it was much more likely to be psychological. (Laughter.)

They had heard a good deal that night of pitfalls and he was going to point out to them a pitfall into which, in the course of the discussion, someone who had pointed out pitfalls had fallen. Dr. Hare had fallen into it in suggesting a routine course of urine examination. He agreed with him that a definite course of examination should always be adopted, because if one did not, some points were likely to be overlooked altogether. But in this particular instance, if he remembered rightly, Dr. Hare said that the first thing for which to examine would be albumen, and then for salts, then microscopically, and then bacteriologically, and he wound up by saying that they should then take the reaction of the urine by litmus. He (Prof. Wooldridge) suggested that the reaction was the *very first* test. that should have been made, because they knew quite well that a neutral urine or a faintly-acid urine might before very long become an alkaline urine and the result of the test would be altogether misleading.

He congratulated Major Kirk on having stimulated such an excellent discussion as he had done that night, and he should read through the discussion in the hope that, he should learn more about urine than he knew at the present time.

Major R. F. WALL expressed the opinion that there was great scope for them in the examination of urine, and he thought, too, that in many of the contagious diseases with which they met greater progress towards recovery might be made if they paid a little more attention to the urine and its examination, because in many instances in his practice he had found that complications had occurred in the kidneys when he least expected them, and by a little care in that direction he had been able to put them right. He wished to congratulate Major Kirk on his paper and on the discussion that he had promoted, and regretted that he could not add more to it.

Dr. F. C. MINETT observed that in the case of cattle a useful purpose might be served by making a bacteriological examination of the urine. Reference had been made by Dr. Hare to pyelo-nephritis in cattle, a condition which had been associated with the presence of diphtheriod bacteria. In deposits from the urine in such cases Gram-positive, club-shaped bacilli would be detected. The reaction of the urine might be expected to be strongly alkaline, as these particular diphtheroids produced alkali in culture media such as broth or milk. It was necessary, however, to note that non-pathogenic diphtheroid bacilli were not infrequently present in urine.

As to the specific gravity of small quantities of urine, it would be sufficient to determine with accuracy the ratio between the weight of a certain volume of the urine and the weight of an equal volume of water.

Major WALL said that he desired to add, to his former observations, a comment concerning Mr. Perryman's statement that he had never seen calculi in the female or uncastrated cat. He confessed that it did not often occur, but during the course of his practice he had met with a number of cases of calculi occurring in both. When they had had them in the castrated cat they had been very troublesome.

Mr. J. W. MCINTOSH said that he wished to thank Major Kirk for introducing what had been a most interesting paper. He thought he had well succeeded in doing what he had set out to do, and that was to create a discussion. The essayist explained at the outset that he did not pose as an authority on the examination of urine, but put his views forward from the clinical standpoint, and he (Mr. McIntosh) thought that in that respect he had succeeded.

Many of the speakers spoke from the point of view of the expert and quite naturally suggested that it was unwise for the clinician to attempt too much, but they must not forget that the majority of clients were not prepared to go to the expense of having an expert examination and in every case the clinician had to do the best he could under the circumstances. As a clinician himself he thought the methods suggested by Major Kirk were at any rate useful and would undoubtedly assist the clinician in arriving at a conclusion. He did not suggest his methods of examining urine as diagnostic but as an aid to diagnosis, and, to that extent, he had succeeded in presenting a paper of value to the Society, and one of the best he had heard for some time. (Hear, hear.) He would like to thank Major Kirk, and to express to him whole-hearted appreciation of the great trouble he had taken in preparing that paper, and the great pleasure it had afforded them. (Applause.)

THE REPLY.

Major H. KIRK: I suppose I deserve it (laughter); in any case, I have got it. I realise now what I perhaps did not realise when first I set out to write a paper on urine, that it was somewhat too ambitious a subject. The more I wrote, the fuller did I appreciate its depths. But my object is achieved, I think, because I wished to stimulate other practitioners to regard with greater importance the investigation of urine in the diagnosis of some of those cases which give little clue to their real nature. In several cases among dogs during the last two months I was mystified until I examined the urine.

The subject is, I think you must agree, one that has escaped discussion by Societies for a very long time. It certainly is an interesting one, and to have evoked so sustained a discussion to-night will have been to set other people thinking. I did not attempt to teach anybody anything new, but, as everybody who has read a paper knows, one must add the appropriate padding to one's clinical experiences in order to give as complete an exposition as possible. This unfortunately entailed references to text-books, upon some of which I have freely drawn and acknowledged. I think I wrote rather too much, although I have been attacked by some speakers for not writing enough.

The first question that Professor Smythe asked me was about mucin; whether it was an abnormal or a normal constituent of urine. So far as I know, in dogs and cats, it is abnormal, but I think in horses, and particularly in mares, mucin is often found without any pathological lesions being present, especially in mares in œstrum. You may remember that cat's bladder I brought to our March meeting, which was filled with a jelly-like substance. This was due either to the presence of mucin or fibrin, but I am

not sure which. I find that diabetes insipidus is rare in dogs; at least, I do not encounter many cases, although that may be because in the past I may not have spotted them.

Professor Smythe asks if I know of any special condition affecting the urine which pre-disposes to the formation of calculi. That is a difficult question to answer, because when you come to think of the constituents of the horse's urine, which is so lavishly supplied with calcium salts in suspension, it is surprising that horses do not more frequently suffer from these concretions. Again, an increase of phosphates in dogs' or cats' urine probably accounts for the sabulous deposits so common in them. A vegetable diet favours an increase in the phosphate content.

Apparently I did not please Dr. Clough, but I should have been surprised if an analytical chemist could not have found faults in a more or less chemical paper. I have admitted having to refer to physiology books, because I cannot carry tests and analyses in my head. He says that I mentioned that all specimens should be microscopically examined if one wishes to be absolutely correct. Weitzmann makes a great point of that and I agree with him. Perhaps I should not have said *all* specimens, though I think if one discovers renal casts in sufficient numbers one is justified in diagnosing kidney disease and definitely ruling out cystitis, urethritis or other urinary diseases. Similarly, if bladder epithelia are found preponderating one is again led to the seat of the trouble. A few casts of varying kinds may not infrequently be seen when viewing normal urine under the microscope, but if one finds a great number I think it would be reasonable to suppose that a nephritis exists, especially if there is other confirmatory clinical evidence.

Dr. Clough asks why one should take the trouble to ascertain the specific gravity of the urine if the normal varies such a great deal. There is no great variation in the majority of the domesticated animals, but in the dog there is great latitude, the specific gravity in their case depending upon variations of diet, etc. To record the specific gravity, however, is a fundamental step, and taken with other things, such as the colour of the urine and the amount passed, and with the clinical symptoms, one might, for instance, be enabled to decide for or against diabetes. Dr. Clough also said "What is the use of talking about microscopic examination for salt deposits if you cannot recognise them?" If Dr. Clough would refer to Weitzmann's book, which he mentioned, he would find some very fine illustrations of a great number of salts, showing the characteristic shapes of the various crystals. I was examining some deposits from urine three or four nights ago and I found a number of all sorts of crystals in it, and, referring to the book, I could distinguish and name quite a lot of them. Therefore, it is useful, and I found it quite interesting to discover what salts the animal had in its urine.

Mr. Livesey asked me "What is 'ash'?" Ash is mentioned as a normal constituent of urine in the analytical tables to be found in most text-books. Further than that I cannot enlighten him. In regard to his other point, there is apparently some difference between organic and inorganic sulphur, but I am not sufficient of a chemist to be able to tell him the difference.

Dr. Sheather asked me something about tubular casts—what do I mean by a large amount, and whether they always indicate the presence of a parenchymatous or croupous nephritis. I should say that if you found tubular casts in a large amount they would so indicate. But there are many different kinds and although they do not all imply nephritis they do, I think, all imply some pathological condition.

I think some of the experts themselves would be hard put to it to answer many of the questions I have been asked (laughter), but I shall do my best. (Hear, hear.)

Mr. Perryman raised the question as to whether urine is an excretion or a secretion. If an excretion is a waste product and one which is not being specifically formed by any particular organ, then I think urine is an excretion. The kidney does not make the urine; it only filters out its various constituents and does not manufacture anything. There is possibly an exception in the case of hippuric acid, which, in the horse, is formed by the union of glycerine and benzoic acid. Also, the kidney is believed to elaborate colouring matter other than urobilin.

I was asked, "What is 'urea'?" As I know it, it is a waste product from the disintegration of protein. I was also asked the cause of chronic diabetes mellitus, and to give an explanation as to how iodine acts as a specific. I fear I cannot answer, but I think many of us would be glad to solve some of these mysteries.

Now we come to the question of calculi in castrated cats. I absolutely disagree with Mr. Perryman about this. I think the universal notion that it is only the castrated cat which suffers from calculi is entirely due to the fact that most cats are castrated. I think they are just as frequent in the uncastrated cat as in the castrated. I must admit I have not seen so many in females, but I understand that several Fellows have seen a number. There is this about it, that in the female cat these deposits and concretions can be voided much more easily than in the male, there being no penial bone or long urethra.

Mr. LIVESEY: If I may interrupt, how do you account for the frequent occurrence of sabulous material in castrated cats, which you meet with so seldom in an equal number of uncastrated cats, and which is often associated with extreme irritation of the skin?

Major KIRK: Assuming you are right, one would imagine that it has some connection with the presence of the testicle, or some product elaborated by that gland, but it is very difficult to know why.

Dr. Hare made my point, the whole point of the paper, when he said we do not investigate enough; we do not take sufficient pains about the conditions we are trying to diagnose. If the reading of this paper will only enable members to see how these different tests and processes will help in many cases, then the paper has been successful.

Dr. Hare asks me what one must expect to learn from the clinical examination of urine. There is quite a number of things. Take, first of all, a simple reaction. If it is highly acid it might show that the dog is a rheumatic subject, if alkaline, when it should be acid, it might indicate catarrh, etc. The colour of the urine is an important matter; it may be discoloured by blood, turbid from pus, dark from fever, light from diabetes, etc., and all such indications put you on the scent as to what else you might find. Specific gravity might be a guide as to whether or not a dog is suffering from diabetes, taken in conjunction with the symptoms. The smell of urine may also be a guide.

I cannot with certainty answer Major Reid Chalmers' question, but I take it that bracken poisoning creates a hæmolytic toxin in the blood stream, resulting in the condition he mentions.

I thank you for the way in which the paper has been received. I expected criticism and I have not been disappointed. (Applause.)

Manufacture of Sheep Dip.—Sir W. Joynson-Hicks in the House of Commons recently informed Mr. W. Thorne that he was advised that the processes of the manufacture of sheep dip were liable to give rise to diseases of the skin but the number of such cases reported in the last few years had been quite small. The Factory Department had not been able to trace any recent cases of a serious character at the Barking Creek factory. and it was presumed that cases to which Mr. Thorne referred in his question had occurred some years ago. The main precautions to be taken were the provision of adequate exhaust ventilation and suitable washing facilities, but these could be already secured in all cases where arsenic was used under the existing provisions of the Factory Act, and he was advised that no additional regulations were necessary.

The Veterinary Record.

30th June, 1928.

THE VICTORIA VETERINARY BENEVOLENT FUND.

Some Comments and an Appeal to the Profession.

By the Honorary Treasurer, E. Alfred West, F.R.C.V.S.

As I sat the other day and listened to the President's remarks at the Annual Meeting of the above, and only a few hours prior to the opening of the beautiful War Memorial Library at the College in Red Lion Square, I wondered whether any of those present realised that scattered about in the towns and villages of the kingdom there are members of our Royal College or their dependents eking out existence on a miserable grant of 10/6 or 15/- a week from this fund, supplemented in some few cases by the Old Age Pension.

Colonel Brittlebank informed his hearers that less than 500 out of 3,486 members of the profession subscribed to this deserving and much needed charity. It relieved in 1927 forty-seven cases of distress, but this year it will be necessary, on account of lack of support, to review the whole of the cases receiving relief, and either to discontinue some of the grants or to reduce the amounts paid to the recipients.

Will members allow this to happen? It is unthinkable, and so deplorable a state of affairs is inexplicable.

We are of necessity rebuilding our London College; we have made our Council Room in Red Lion Square one worthy of the dignity of our profession, and we have completed the reconstruction of a new library in honour and in memory of those who made the supreme sacrifice for their country in the Great War, but yet we fail in our individual duties to our poor and needy professional brethren.

Less than 3d. per week from each, *or even a majority* of the members, cannot be beyond their means however limited these may be, and the lack of interest and support of the Fund can be but one more evidential fact of that apathy which is regrettably so obviously characteristic of us as a body. The Fund is managed by an annually elected Council—much labour and time are cheerfully given; the greatest care is taken to prevent abuse or extravagance, and the total cost of administration is only £150 a year, including all advertising, printing, and postage.

Visualise, if you will, these unfortunate people receiving notice of the reduction of their already meagre grant, or, perhaps, its total discontinuance, and remember that the recipients are in most cases aged and infirm folk utterly unable to help themselves, many crippled and suffering from other ailments, putting up a continual struggle against poverty, and lacking the few comforts without which life to old people is barely worth living. Not a pleasant picture to contemplate, especially at a time when we are as a profession at last gaining that Governmental and public recognition for which we have so long striven.

Do not let us expose ourselves to the reproach of being indifferent to our poor and afflicted brethren. Let non-subscribers AWAKE and carry out the sacred duty to which the President referred. So small a sum as is necessary to become a subscriber cannot be missed even by those of small means, and one can but assume that it is only want of thought which accounts for so small a percentage of supporters. Year after year goes by with no perceptible increase of regular contributors, and the Council, besides knowing no way of activating the interest of the profession, is itself in danger of getting into a position of anxiety almost amounting to despair. The Fund would be in a poor way were it not for the liberality of a few generous donors who from time to time come so handsomely to its rescue.

One can only wish that these inadequate lines could be printed in scarlet ink.

The Victoria Veterinary Benevolent Fund.

Annual General Meeting.

The Annual General Meeting of Members of the Victoria Veterinary Benevolent Fund was held at the Royal College of Veterinary Surgeons, 10 Red Lion Square, London, W.C., on Thursday, 7th June, 1928, immediately after the Annual Meeting of the Royal College of Veterinary Surgeons. Lieut.-Col. J. W. Brittlebank (President) occupied the Chair, and the following members were present:—Major J. Abson, Mr. J. C. Coleman, Major G. W. Dunkin, Major A. N. Foster, Professor F. T. G. Hobday, Mr. J. Holroyd, Mr. W. S. King, Sir John M'Fadyean, Mr. J. W. McIntosh, Mr. F. H. Manley, Major-Gen. Sir John Moore, Mr. A. M. Munro, Dr. A. Leslie Sheather, Lieut.-Col. P. J. Simpson, Mr. S. H. Slocock, Mr. Trevor F. Spencer, Capt. W. K. Townson, Capt. S. Villar, Mr. E. Alfred West, Mr. J. Willett, and Professor G. H. Wooldridge.

The Secretary, having read the Notice convening the meeting, the Minutes of the previous General Meeting, which had been published in the *Veterinary Record*, were taken as read and confirmed.

Election of Officers.

President. On the motion of Mr. J. Willett, seconded by Mr. E. Alfred West, the retiring President, Lieut.-Col. J. W. Brittlebank, C.M.G., was unanimously re-elected President for the ensuing year.

Vice-Presidents. On the motion of Mr. J. C. Coleman, seconded by Major-General Moore, the retiring Vice-Presidents, Messrs. Sidney H. Slocock, O. Charnock Bradley, Arnold Spicer, and Sidney Villar were unanimously re-elected Vice-Presidents for the ensuing year.

Hon. Treasurer. The President: I have much pleasure in moving: "That Mr. E. Alfred West be re-

elected Honorary Treasurer of the Benevolent Fund." I do not think any words of mine are necessary to eulogise the great work Mr. West does and how thoroughly he does it. I move his re-election with very great pleasure.

Major J. ABSON, D.S.O., seconded the motion, which was carried with acclamation.

Hon. Secretary. The PRESIDENT: I also have great pleasure in moving "That Lieut.-Col. P. J. Simpson, J.P., D.S.O., be re-elected Honorary Secretary." Col. Simpson is a very shy man, although many of you would not believe it; but there is no harder worker for this cause than Col. Simpson. (Applause.)

Mr. J. W. MCINTOSH seconded the motion, which was carried unanimously.

Mr. West and Col. Simpson briefly thanked the members for their re-election to their respective offices.

Hon. Auditors. On the motion of Col. P. J. SIMPSON seconded by Major-General Sir JOHN MOORE, the retiring Auditors, Messrs. Woodhouse and Wilkinson, were unanimously re-elected.

ANNUAL REPORT AND STATEMENT OF ACCOUNTS.

The PRESIDENT: In presenting the Annual Report of the Council, I need only draw your attention to the fact that the Fund now has on its books 45 cases, and that the total amount spent in relief during the year was £1,363 18s. 4d., which constitutes a record. Towards this sum the subscriptions of members provide only £465 3s. 6d., or little more than one-third. Less than 500 members of the profession subscribe to the Fund, which is about one-seventh of the number on the register. I think that is the least satisfactory feature of the Report. We have, however, several very good friends, one of whom is Mr. Arnold Spicer, who made a donation of £35 during the year, and that is merely one of a series of similar donations he has been making for many years past. We cannot thank him sufficiently for this generous help. We owe also a debt of gratitude to our friend, Col. P. J. Simpson, through whose instrumentality the Fund benefited to the extent of £162, a truly welcome donation.

Unfortunately, the Council finds itself compelled to look very narrowly into the circumstances of all the persons who are now receiving grants from the Fund, for it will be necessary to reduce some of them wherever possible, and perhaps to discontinue others. The income of the Fund will not permit of the expenditure of another £1,364 next year unless a considerable increase in subscriptions is received. I hope that after reading this report you will all become advocates for the Fund and will persuade your friends who have not subscribed to become members.

I propose to take the report page by page, beginning at page 5.

The report was gone through page by page, but no members desiring to ask any questions, on the motion of Col. SIMPSON, seconded by Mr. MCINTOSH, the Annual Report was unanimously received and adopted.

The PRESIDENT: Now we come to the Financial Statement. The Treasurer is here and will gladly answer any questions that any member would like to put to him, or he would be very glad to make any suggestions that any of you would like to offer with regard to the investment of any money.

No member desiring to ask any questions, on the motion of Prof. G. H. WOOLDRIDGE, seconded by Major J. ABSON, the Statement of Accounts was unanimously adopted.

Council. On the motion of Mr. J. W. MCINTOSH, seconded by Mr. SIDNEY VILLAR, the following ten members of the Association were re-elected to serve on the Council:—F. Leeds Gooch, F.R.C.V.S., P. J. L. Kelland, M.R.C.V.S., G. H. Locke, M.R.C.V.S., Major-Gen. Sir John Moore, K.C.M.G., C.B., F.R.C.V.S., A. M. Munro, M.R.C.V.S., H. Sumner, M.R.C.V.S., J. Willett, M.R.C.V.S., Prof. G. H. Wooldridge, F.R.C.V.S., T. Dunlop Young, M.R.C.V.S., D.V.S.M., and W. Jackson Young, F.R.C.V.S., D.V.S.M.

VOTES OF THANKS.

The PRESIDENT: Before we conclude, I would like to move a special vote of thanks to Mr. Bullock, the Secretary. (Cheers.) Mr. Bullock, as you know, has been assiduous in his service to this Fund, and what we should do without him I do not know. I know he does not like any fulsome flattery, or anything of that sort, but it is mere justice to Mr. Bullock to thank him for all the work he had done for this Fund during the past twelve months.

Mr. E. ALFRED WEST: I am most happy to associate myself with your remarks, Sir, which I entirely endorse. Nobody has greater knowledge than I have of the excellent work Mr. Bullock does for the Fund.

Col. P. J. SIMPSON: I should like to associate myself with the remarks that have been made by the President and Mr. West in moving and seconding this vote of thanks.

The resolution was then put and carried with acclamation, and Mr. Bullock having briefly acknowledged the compliment, the meeting terminated.

R.A.V.C. Annual Dinner.

The following is a list of officers who attended the above Dinner on Friday, the 15th June, 1928, at the Hotel Cecil:

Major-General H. T. Sawyer, C.B., D.S.O., Presiding, Director-General, Army Veterinary Services.

Major-Generals Sir Layton J. Blenkinsop, K.C.B., D.S.O., Colonel Commandant, and Sir John Moore, K.C.M.G., C.B., F.R.C.V.S.

Colonels W. S. Anthony, C. M. G., A. Olver, C.B., C.M.G., F.R.C.V.S., W. A. Pallin, C.B.E., D.S.O., F.R.C.V.S., A. G. Todd, C.B.E., D.S.O., G. K. Walker, C.I.E., O.B.E., and F. W. Wilson, C.B., C.M.G., F.R.C.V.S.

Lieutenant-Colonels J. J. Aitken, C.M.G., D.S.O., O.B.E., E. P. Argyle, D.S.O., T. E. Burridge, A. E. Clarke, P. W. Dayer-Smith, O.B.E., W. B. Edwards, H. E. Gibbs, D.S.O., F. D. Hunt, O.B.E., B. L. Lake, D.S.O., O.B.E., W. A. McDougall, D.S.O., O.B.E., F.R.C.V.S., F. C. Stratton, and W. H. Walker, D.S.O., O.B.E.

Majors J. O. Andrews, D.S.O., R. M. Bamford, O.B.E., J. S. Bowden, O.B.E., C. K. Calder, A. F. Castle, F.R.C.V.S. A. C. Duncan, F.R.C.V.S., T. J. Davis, F. B. Ditmas, A. N. Foster, O.B.E., R. A. Gooderidge, O.B.E., G. V. Golding, T. S. Green, E. P. V. Hearne, O.B.E., H. J. Holness, D.S.O., H. C. Jagger, O.B.E., R. H. Knowles, H. Kirby, D.S.O., A. G. Lalor, V. C. Leckie, D.S.O., H. D. Lewis, T. Lishman, R. W. Mellard, D.S.O., C. A. Murray, J. S. Nimmo, D.S.O., C. S. Northcott, F. C. O'Rorke, C.M.G., F.R.C.V.S., G. E. Oxspring, A. A. Pryer, D.S.O., G. C. B. Rees-Mogg, O.B.E., C. G. Saunders, D.S.O., W. H. Simpson, H. Stephenson, M.C., W. H. Thomas, A. J. Thompson, L. M. Verney, D.S.O., F.R.C.V.S., T. E. Campey, M.B.E.

Captains W. E. Barry, W. H. Priston, F.R.C.V.S., and A. L. Wilson.

Lieutenant-General Sir W. Hastings Anderson, K.C.B., Quartermaster-General to the Forces, was the guest of the evening.

CLINICAL REPORT.

Lamb Dysentery Prophylactic in 1928.

By T. DALLING, J. H. MASON and W. S. GORDON,
Langley Court, Beckenham, Kent.

During 1927 and 1928 further field trials of Lamb Dysentery Vaccine, prepared from organisms previously described, isolated from lambs acutely affected with lamb dysentery, have been made. Experiments have been carried out as in former years, namely, ewes have been inoculated once during the autumn and again about a fortnight before lambing began in the flock. Experiments have so been arranged that uninoculated ewes, comparable in every way, running on the same ground and lambing at the same time as the inoculated, have been kept as controls. *Post-mortem* examinations have been carried out by one of us (W. S. G.) on every lamb which has died, no matter from which ewe or from what cause.

Three types of vaccine were used: (A) The same as that used during last season, and (B) and (C) slight modifications. The following are the results of the death rate on thirty-one farms among lambs born from ewes inoculated with the various types of vaccine and from control ewes on the same farms:—

Lambs born from ewes inoculated with type A vaccine—2,120, of which 17 or 0·80 per cent. died of lamb dysentery; type B vaccine—744, of which 8 or 1·12 per cent. died of lamb dysentery; type C vaccine—1,157, of which 13 or 1·12 per cent. died of lamb dysentery.

Lambs born from uninoculated ewes—2,523, of which 330 or 13·05 per cent. died of lamb dysentery.

In diagnosing lamb dysentery in lambs only those showing evidence of ulceration of the intestine on *post-mortem* examination have been classified as being affected with lamb dysentery.

In addition to the above experiment many thousands of ewes have been inoculated in various parts of the country with vaccine of the A type and the death rate from lamb dysentery among their lambs has been very small.

Anti-serum as used last year has been injected into many hundreds of lambs during the past lambing season; amongst them the death rate from lamb dysentery is under 1 per cent. On some farms it was found possible to control the results of the action of the serum by injecting only alternate lambs born. The result of such work is that on fifteen farms over 1,000 lambs were injected within a few hours of birth; the death rate from lamb dysentery was approximately 0·5 per cent. On the same farms the death rate from an almost equal number of controls was over 18 per cent.

It is proposed to publish a full account of the season's work at a later date.

R.C.V.S. OBITUARY.

MACADAM, Alexander, 7 Old King Street, Bristol. Graduated, Glasgow, 29th April, 1881. Died, 23rd May, 1928, aged 71.

MORAN, William James, 40 Station Road, Beccles, Suffolk. Graduated, Dublin, 20th July, 1907. Died, 14th June, 1928, aged 44 years.

DIVISIONAL REPORT.

Lincolnshire and District Division.

The members of this Division who attended the meeting which was held at Peterborough on Thursday, June 14th, were privileged to hear from Dr. G. W. Clough, Professor of Chemistry at the Royal Veterinary College, London, a paper of the greatest interest to them as clinicians, on "Some Cases of Poisoning amongst Farm Animals by Food or Medicine." A valuable discussion ensued and both this and the paper are reproduced at the commencement of this issue of the *Record*.

The Chair was occupied by the President (Mr. W. A. Dickinson) and there were also present Messrs. G. Eaton, F. L. Gooch, F. W. Gooch, T. Knowles, W. W. Lang, G. Lockwood, J. H. Poles, E. Porter-Smith, A. Williams, and H. C. Reeks, *Hon. Secretary*, together with the following visitors: Mr. G. Atkinson, Dr. G. W. Clough, and Dr. A Leslie Sheather.

Apologies for absence were received from Messrs. T. B. Bindloss, H. H. Truman, C. W. Townsend and H. C. Reeks, senr.

At the outset the PRESIDENT welcomed the members and referred to the fact that as the members of that Division were very widely spread over its area it was very difficult to get everyone to attend its meetings.

Continuing, Mr. Dickinson said that he had been very surprised to learn that, in his absence, he had been, at their last meeting, elected to the Presidential Chair. Nevertheless, he thanked them very much for the honour they had thus conferred upon him.

The *Minutes* of the previous meeting of the Division, having been published in the *Record*, were taken as read and were confirmed and signed.

Nominations and Election.—A pleasing feature of the gathering was the nomination for election to membership of Messrs. G. Atkinson (Stamford), A. Logan (Norwich), and J. Plenderleith (Ministry of Agriculture, stationed at Lincoln), and the election as a member of Mr. R. W. A. Watchorn (Ministry of Agriculture, stationed at Grimsby).

The Burghley House Exhibition.—Mr. F. L. GOOCH said that he thought the members would be interested to hear a little about the result of the working of the veterinary surgeons' stall at the recently-held Arts and Crafts Exhibition at Burghley House in aid, amongst other objects, of the Royal Veterinary College Re-building Fund. The returns were not quite complete, but he was hoping that the Re-building Fund would have at least 50 guineas as a result. He was not referring to the members present when he said that the members of the veterinary profession as a whole did not give to the project the support that they should have done, as up to the morning of the Exhibition only ten had sent anything, while he subsequently received three small donations, but he was thankful to say that he had received noble assistance from the wives of some of the veterinary surgeons in the district. (Hear, hear.) He thought the Exhibition itself would realise about £300 and a large proportion of that would go to the College. (Applause.)

The PRESIDENT said he thought they should accord Mr. Gooch a very hearty vote of thanks for his effort, because

he knew that Mr. Gooch had done an immense amount of work in connection with the veterinary surgeons' stall at the Exhibition. He had written to a great number of people, had bills printed and had advertised the stall. He must have spent a great deal of time and trouble in his endeavour to make the thing a success, and the measure of success which had been achieved was due to the whole-hearted activities of Mr. Gooch.

The vote of thanks, which was seconded by Mr. PORTER-SMITH, was carried with enthusiasm and was suitably acknowledged by the recipient.

The President now called upon Dr. Clough to present his paper, in which the members evinced the greatest possible degree of interest and which promoted an animated discussion. Dr. Clough was warmly thanked for his valuable paper and for the trouble he had taken in visiting Peterborough to present it in person. The President also expressed the pleasure which was felt at the presence of Dr. Sheather.

Before the meeting concluded, Mr. W. W. LANG suggested that there should be arranged a joint meeting between that Division and the Lincolnshire Branch of the National Farmers' Union, as he had been requested to deliver to the latter a popular lecture on the subject of abortion and sterility generally and he hoped that, by the presence of members of the Division, the farming community might be impressed by the readiness of the veterinary profession to help them in dealing with that most difficult and menacing problem. As they would be aware, he had long been interested in the treatment of sterility and diseases of the generative organs and, as everyone knew, the loss to the agricultural community from these pathological conditions was simply terrific. Their treatment was a matter to the importance of which the members of the profession should be awakened and in which they should be prepared to play the part which would be required of them. How many country practitioners, asked Mr. Lang, were treating those cases at the present time? He could assure them that he was not taking lightly the proposition that he should address the farmers on that matter, and he would be glad of the assurance that his professional brethren would support him.

Decision upon this matter was deferred, and the meeting concluded with the passing of a vote of thanks to the President for his services in the Chair.

H. C. REEKS, JUN., *Hon. Secretary.*

R.C.V.S. FELLOWSHIP EXAMINATIONS.

An Examination for the Fellowship Diploma was held at 10 Red Lion Square, W.C.1, on Thursday, June 14th, 1928, when the following candidate was successful:—

MR. HUGH TREVOR MATTHEWS.

Thesis.—"Observations on Bovine Tuberculosis with Special Reference to Rapid Diagnosis."

Examiners.—T. J. Bosworth, Esq., B.Sc., M.R.C.V.S., D.V.S.M., Sidney Villar, Esq., F.R.C.V.S.

Chairman.—Professor J. B. Buxton, M.A., F.R.C.V.S., D.V.H.

The Fellowship Diploma has also been awarded to:—

MR. A. D. MCGREGOR.

Thesis.—"Non-sweating in Horses."

Examiners.—Major L. P. Pugh, B.Sc., F.R.C.V.S.; H. E. Cross, Esq., A.Sc., M.R.C.V.S.

NOTES AND NEWS.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

July 2nd—Meeting of Finance Committee N.V.M.A., 4 p.m.; Editorial Committee, 4-30 p.m.

July 4th—Meeting of the Southern Branch N.V.M.A. at 10 Red Lion Square, 2 p.m.
Meetings of Council and Committees N.V.M.A. at 10 Red Lion Square; Council Meeting at 2-30 p.m.
R.C.V.S. Annual Dinner, Hotel Victoria, W.C.2; President's Reception, 7 p.m.
Meeting of the South Eastern Division at the Wellcome Research Laboratories, Beckenham, Kent, 2 p.m.

July 5th—R.C.V.S. Committee Meetings.

July 6th—R.C.V.S. Committee and Council Meetings.
4 p.m., Meeting of Organising Committee for the International Veterinary Congress, 1930.

July 7th—Meeting of the Dumfries and Galloway Division at the Crown and Mitre Hotel, Carlisle, 1-30 p.m.

July 10th—R.C.V.S. Written Examinations.

July 12th—R.C.V.S. Oral Examinations begin in London.
Meeting of the Central Division at Messrs. Armour & Co.'s Laboratory, Bermondsey, 3 p.m.

R.C.V.S. ANNUAL DINNER.

We would again remind our readers that applications for tickets for the Annual Dinner to be held at the Hotel Victoria, on Wednesday next, July 4th, at 7 p.m., should be sent in at once to the Secretary at No. 10 Red Lion Square, W.C.1. The price of tickets is 12s. 6d. and places can be reserved for all members who apply by latest on Monday next.

A large number of influential guests will be present, including the Minister of Agriculture, the Rt. Hon. Walter Guinness, D.S.O., who has promised to propose the toast of "The Royal College"; Col. Sir George Courthope, M.P., Chairman of the Agricultural Committee of the House of Commons, who will respond to the toast of "Agriculture," and Col. F. E. Fremantle, M.P., M.D., who will respond for "Medical Science"; Lord Lovat, Under Secretary of State for the Dominions; several members of Parliament; the Presidents of allied Societies; Metropolitan Magistrates; members of the Medical Profession, etc., have also promised to attend.

The occasion is one, therefore, in which members of the Profession, who are interested in the work of the Council may co-operate by attending in large numbers to support the President. It is by mutual intercourse at functions of this kind that much valuable work may be done in furtherance of the ideals of the Profession, but the Dinner can only be successful if well attended.

During the evening a presentation of silver, subscribed for by over 600 members of the Profession, will be made to Sir John M'Fadyean, late Principal of the Royal Veterinary College, and this is another special reason why all members who can, should be present. The articles comprising the presentation will be on view in the Reception Room at the Hotel.

New Members.

Members of the Profession wishing to join the Association on and after July 1st, will be admitted at the reduced subscription of one guinea for the current year.

H.M. Stationery Office Publications.

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses:—London: Adastral House, Kingsway, W.C.2, and 28 Abingdon Street, S.W.1; Cardiff: 1 St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120 George Street

	Price Net.	Post Free.
Statutory Rules and Orders, 1928.	s. d.	s. d.
459. Animal. Diseases of Animals. Sheep Scab (Amendment) Order, 1928, dated June 6th, 1928 ...	0 1	0 1½
House of Commons Bills, 1928.		
123. Protection of Animals. To extend the operation of the enactments relating to the Protection of Animals in respect of animals kept in captivity or confinement and released for the purpose of being hunted or coursed	0 2	0 2½

CORRESPONDENCE.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents

Royal Sanitary Institute's Congress.

Programme of the Veterinary Hygiene Section.

To the Editor of The Veterinary Record.

Sir,—For the information of your readers who are desirous of making arrangements to attend the Veterinary Hygiene Section of the Royal Sanitary Institute's forthcoming Congress in Plymouth, I beg to furnish you with the programme of papers and discussions, etc. It is as follows:

Veterinary Hygiene Section.

To be held in St. Andrew's Lower Hall, Plymouth.

President.—Professor F. T. G. Hobday, C.M.G., F.R.C.V.S., F.R.S.E., Principal, Royal Veterinary College, London.

Vice-Presidents.—Major A. B. Bowhay, O.B.E., M.R.C.V.S.; Professor J. Basil Buxton, M.A., D.V.H., F.R.C.V.S., Director of Institute of Animal Pathology, Cambridge; W. B. Nelder, F.R.C.V.S., Exeter, Devon; J. Percy Penhale, M.R.C.V.S., Castle Street, Barnstaple, Devon; Major W. Ascott, O.B.E., M.R.C.V.S., Bideford, N. Devon; W. G. Blackwell, M.R.C.V.S., Exmouth, Devon; John Dunstan, M.R.C.V.S., Liskeard, Cornwall; James Forbes, M.R.C.V.S., Truro; E. R. Smythe, M.R.C.V.S., Falmouth, Cornwall; S. J. Motton, F.R.C.V.S., Penzance; R. H. Smythe, M.R.C.V.S., Camborne, Cornwall; J. C. Collings, M.R.C.V.S., Plymouth, Devon.

Recording Secretary.—James R. Hayhurst, M.R.C.V.S., D.V.S.M. (Vict.).

Local Secretaries.—John Thorning, Plymouth and R. E. Blundell, Plymouth.

Thursday, July 19th.

10 *a.m. to* 1 *p.m.*

1. Presidential Address.

2. A paper on "Animal Parasites commonly met with in Meat Inspection," by W. J. B. DeVine, M.C., F.R.C.V.S., D.V.S.M., Birmingham. Discussion to be opened by J. A. Dixon, M.R.C.V.S., Leeds, to be followed by W. Jackson Young, F.R.C.V.S., D.V.S.M., Newcastle-upon-Tyne; J. McAllan, M.A., B.Sc., M.R.C.V.S., Aberdeen; and A. Alexander, M.R.C.V.S., D.V.S.M., Salford.

Friday, July 20th.

Before attending the Veterinary Hygiene Section, delegates are invited to attend Section "B," Engineering and Architecture, from 9-30 a.m. to 11 a.m. to hear a paper on "The Construction of Modern Abattoirs," by Stephen Ayling, F.R.I.B.A., F.R.S.I.

11 *a.m. to* 1 *p.m.*

A paper on "The Use of Mechanically Operated Instruments in the Slaughter of Animals for Food and other Purposes," by A. C. Dewbury, Manager of the Humane Slaughtering Department, Royal Society for the Prevention of Cruelty to Animals. Discussion to be opened by W. J. B. DeVine, M.C., F.R.C.V.S., D.V.S.M., Birmingham, to be followed by Professor R. G. Linton, M.R.C.V.S., Royal (Dick) Veterinary College, Edinburgh; E. J. Burndred, M.C., D.V.H., M.R.C.V.S., Blackburn, and F. L. Gooch, F.R.C.V.S., Stamford.—Yours faithfully,

James R. Hayhurst.

Metropolitan Cattle Market,
Islington,
London, N.7.
June 23rd, 1928.

The Lippiza Horses.

To the Editor of The Veterinary Record.

Sir,—Those interested in "*Haute école*" horsemanship should not fail to visit the International Horse Show at Olympia, and watch the evolutions of the Lippiza horses from the Imperial Riding School of Vienna, which has existed as a Stud for over 300 years.

From a veterinary point of view the horses are interesting in that their breeding percentage is high. I was informed by Professor Dr. F. Benesch, who kindly arranged for a private view of these horses in the Imperial Riding School a few weeks back when I was Vienna, that between 80 and 90 per cent. was the estimate, and this, for a breed that must have been interbred for such a long time, I thought exceptional.

Another interesting veterinary point about this Stud is that, two years ago, they contracted equine contagious abortion and 80 per cent. of the foals were premature. The source of the trouble, Dr. Benesch informed me, was traced to hay brought from an infected district. The disease was completely eradicated in one year by auto-vaccination.—Yours truly, W. S. Stevens.

c/o Glyn, Mills and Co.,
3 Whitehall Place,
London, S.W.1.

R.C.V.S. Council Election.

To the Editor of The Veterinary Record.

Sir,—I shall be glad if you will allow me to thank the gentlemen who kindly voted for me, and to express the hope that at the next election I shall have the honour to represent them on the Council.—I am, Sir, faithfully yours, Reg. F. Wall.

128 Queen's Road,
Bayswater,
London, W.2.
June 20th, 1928.

The Editor acknowledges the receipt of the following:—

County of Lanark Veterinary Inspector's Report of work done under the Milk and Dairies (Scotland) Act, 1914, for the year 1927.

Communications from Messrs. R. E. Alexander (Weymouth), J. R. Baxter, H. J. Dawes, J. R. Hayhurst (Islington) T. H. M. Hughes (Birmingham), T. H. Michie (Liverpool), G. P. Purvis (Perak, F.M.S.), Major-General H. T. Sawyer, Messrs. Henry Taylor (Hayward's Heath) and P. Welch (Saffron Walden).